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# Evaluation of exotic and adapted maize (Zea mays L.) germplasm crosses

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Evaluation of exotic and adapted

maize (*Zea mays* L.) germplasm crosses

by

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# GENERAL INTRODUCTION

Maize (*Zea mays* L.) is an important crop in the world economy and is an ingredient in manufactured items that affect a large proportion of the world's population (Hallauer and Miranda, 1981). One of the challenges for a breeding program for maize is to continuously increase grain yield through the genetic improvement of hybrid cultivars. Improvements in the different crops species by plant breeding are usually followed by a decrease in genetic diversity, especially in the materials that ultimately reach commercial production. As a result, the hybrids in farmer's fields face increased genetic vulnerability and at the same time increases the risks of economic loss. In any plant breeding program genetic variability must be present. If it is not present in the breeding populations, selection will not be effective. Choosing the initial germplasm and the breeding procedure are two equally important decisions that maize breeders have to make (Hallauer and Miranda, 1981).

Since the early 1970s some authors have expressed their concern about the narrowing of the genetic base of maize (Eberhart, 1971; National Academy of Science, 1972; Lonnquist, 1974; Brown, 1975; Crossa and Gardner, 1987). History shows that problems can occur when the genetic base of a crop becomes too narrow and changes in the environment, such as new pathogens, new insect pests, or unusual environment stresses, adversely affect the crop's productivity. As examples, the Irish potato (*Solanum tuberosum* L.) famine due to late blight (incited by *Phytophthora infestans* (Mont.) D By.) and the southern corn leaf blight (incited by *Bipolaris* *maydis* (Nisikado) Shoemaker, race T) epidemic in maize (*Zea mays* L.) show the devastating nature of such occurrences (National Academy of Science, 1972). In both crops the diseases were due to the widespread genetic uniformity of the crops and the development of the diseases to epidemic proportions. Maize breeders in the U. S. Corn Belt have concentrated breeding efforts in a restricted and small sample of the total available genetic variation in maize (less than 5%; Brown, 1975). It seems unreasonable to assume that most of the favorable alleles are concentrated in that small sample.

The use of exotic germplasm for the improvement of maize in the U.S. Corn Belt has been suggested (Wellhausen, 1965; Hallauer, 1978; Geadelmann, 1984). Most of the emphasis placed on the utilization of exotic germplasm has been a consequence of the concern about the genetic vulnerability in relation to disease susceptibility. Few breeders have examined the use of exotic germplasm as a source of valuable genetic variation for yield and other agronomic traits (Iglesias, 1987).

Utilization of exotic germplasm contributing novel sources of variation for both quantitative and qualitative traits and implementation of recurrent selection methods to increase gene frequency of favorable alleles in breeding populations are two of the more important supporting factors for continuous genetic gains (Russell, 1986). Recurrent selection schemes imposed on populations do not create new alleles *per se*, but they do create new genetic combinations and increase the frequency of favorable alleles (Hallauer and Sears, 1972).

The great diversity within the tropical and semi-tropical collections

of maize has been recognized as an opportunity to broaden the genetic base of maize hybrids in the United States. According to Hallauer (1980), maize breeders have been reluctant to use exotic germplasm because:
1) adequate genetic variability in adapted germplasm seems available for genetic progress; 2) mean performance level is reduced with incorporation of exotic germplasm; and 3) use of exotic germplasm does not have an immediate impact on short-term breeding goals.

Goodman (1985) presented several reasons to explain the limited use of exotic germplasm in the U.S. Corn Belt:
1) adverse photoperiod response masks desirable characters; 2) improvement of landrace materials is 40 years behind currently used breeding materials; 3) linkages between favorable and unfavorable genes in exotic x adapted populations cannot readily be broken; and 4) no current basis exists for choosing the best exotic germplasm for use in breeding. Randomly chosen materials (foreign or domestic) do not have a future in today's plant breeding.

The issue is that most of the exotic maize germplasm is not well adapted to major production areas of the United States and using it in breeding programs presents formidable problems (Goodman, 1985). To overcome problems of adaptability, long-term selection programs for adaptation and improvement of the mean performance level are required (Hallauer, 1980). The choice of a exotic germplasm to use in a breeding program must be based upon its performance *per se*, or in combination with adapted materials under short-day conditions in direct comparison with adapted, commercial hybrids. Perhaps the limited success in using exotic germplasm in the past can be attributed more to poor choices of populations than to the choices of the breeding schemes employed. As a result, the choice of breeding materials is critical to the success of an exotic maize breeding program, yet it is an area that receives very little attention in current programs (Goodman, 1985).

The objectives of my study were 1) to determine the relative performance of exotic germplasm to two widely used U.S. Corn Belt populations; 2) to determine the proportion of exotic to adapted germplasm that exhibited superior performance; and 3) to determine the heterotic pattern between the exotic populations and the two widely used U.S. Corn Belt populations.

## Explanation of Dissertation Format

This dissertation was written in the Iowa State University alternate format, which includes a complete manuscript that will be submitted to a professional journal. The dissertation includes a General Introduction and a Literature Review before the paper and a General Summary and General References after the paper. The General References include citations from the General Introduction and Literature Review. The study was conducted to determine the relative performance of exotic populations to two widely used U.S. Corn Belt populations, to determine the proportion of exotic to adapted populations that exhibited superior performance, and to determine the heterotic patterns between the exotic populations and the two widely used U.S. Corn Belt populations. A data appendix appears at the end of the dissertation. The appendix will not be included in the published manuscript.

# LITERATURE REVIEW

Maize (*Zea mays* L.) breeding has been effective in developing improved varieties and hybrids to meet the rapidly changing cultural conditions of the past 100 years (Hallauer and Miranda, 1981). The concern for genetic diversity in maize has received attention after the shift from double-cross to single-cross hybrids and more recently after the southern corn leaf blight [incited by *Bipolaris maydis* (Nisikado) Shoemaker, race T] epidemic in maize. It has been hypothesized that the shift to single crosses reduced the amount of variability through the reduction in the number of parents involved in hybrid production (Hallauer and Miranda, 1981).

From biochemical data, U.S. maize cultivation and breeding appear to remain heavily dependent upon usage of the inbred lines B73, A632, Oh43, and Mo17 or closely related derivatives (Smith, 1988). As a result, the seed sold to the farmers faces increased genetic vulnerability and at the same time an increase in risks of economic loss caused by new pathogens, new insect pests, or unusual environmental stresses. According to Goodman (1985), breeders in the U.S. Corn Belt are using only 5% of the total available genetic resources in their programs. It seems unreasonable to expect that most of the favorable alleles for maize improvement are concentrated in that small sample (Brown, 1983). Smith (1988) observed that 'Iowa Stiff Stalk Synthetic' lines crossed to 'Lancaster Sure Crop' derived lines still appear to be the predominant heterotic pattern. The continuous release of different inbred lines suggests that widely used lines represented diverse germplasm (Duvick, 1981, 1984; Zuber and Darrah, 1980).

Brown (1975) observed that despite its relatively narrow genetic base, a considerable amount of genetic variation exists within U.S. corn breeding materials. A survey of the trends in per area yields in the U.S. is all that is needed to conclude that despite the relatively narrow germplasm base on which it rests the total breeding effort of the past half century has been effective. As an example, the United States produces 50% more grain on 25% fewer acres than it did in the days of the open-pollinated varieties. Genetic diversity can be found within maize. In the modern cultivars, only a small part of the total diversity available is represented. Another observation made by Brown (1975) is that in the United States more than 90% of the breeding effort is devoted to germplasm whose origin traces to not more than 3 of 130 existing races. Thus U.S. corn improvement programs have largely ignored 98% of the germplasm which makes up *Zea mays*.

Gracen (1986) concluded that genetic diversity *per se* is not needed in the maize crop. Today, there are more than 500 hybrids available in the U.S. market, representing the restricted genetic base in the field that is a consequence of the choice made by farmers among a few related elite hybrids. Troyer et al. (1988) emphasized that genetic vulnerability in the production area can be reduced by choosing different hybrid genotypes that maximize profitability and at the same time minimize risk across production area.

Another way to reduce the genetic vulnerability of the maize populations would be to increase the genetic variability, which is a basic element necessary to any plant breeding program. Hybridization of adapted material, mutagenic agents, and the introduction of the exotic germplasm are mechanisms that can be used for creating genetic variability. According to Hallauer and Sears (1972), the methods used differ among plant breeders and the particular crop species.

Wellhausen (1965) emphasized the tremendous potential for the improvement of maize in the U.S. Corn Belt from the use of exotic germplasm. He pointed out that the introduction of exotic maize germplasm is potentially important for increasing genetic variability in our populations and enhancing heterosis because of genetic diversity.

Hallauer and Miranda (1981) defined exotic germplasm as "all germplasm that does not have immediate usefulness without selection for adaptation for a given area." In the U.S. Corn Belt, exotic germplasm is usually considered to include unadapted domestic, foreign, temperate, tropical, and semitropical populations (Stuber, 1986). Much of the available maize germplasm contains highly undesirable alleles linked to those few favorable alleles that the breeder wants to use (Duvick, 1981).

Some reasons are given from different researchers to account for the limited use of exotic germplasm. Dudley (1988) emphasized that the use of exotic maize germplasm has been limited by the lack of methodology for identifying populations containing favorable alleles affecting quantitative traits, which are not already present in adapted hybrids. Holley and Goodman (1988) stated that tropical maize breeding programs have developed relatively few good inbred lines that would be useful in a program of adaptation to U.S. growing conditions. Also, little information is available to aid the breeder in selecting and developing long-term breeding strategies for exotic germplasm, especially photoperiod-sensitive tropical materials. According to Stuber (1986), limited use of exotic germplasm is because desirable characters are masked by adverse photoperiod responses, the time involved to obtain useful materials from exotic populations, difficulties in breaking linkages between favorable and unfavorable genes, restricted information upon which to base the choice of the best exotics for use in breeding, and presence of one more major weaknesses which makes them difficult to evaluate, maintain, and use. Although there are several problems in the use of exotic germplasm, exotic germplasm has been evaluated for genetic diversity and possible use in maize breeding programs. Goodman (1985) indicated that about 1% of the commercial hybrids in use in the United States were based in part upon exotic germplasm. Those hybrids, however, averaged less than 20% exotic germplasm.

Geadelmann (1984) mentioned that incorporation of exotic strains into adapted germplasm would increase the available genetic variability and would give rise to additional heterotic vigor. According to Lonnquist (1974), the use of exotic germplasm requires that long-term programs need to be implemented to allow mild selection for gradual recombination of useful genes and gene complexes linked with unadapted genes. Also, in order to have a successful use of exotic germplasm, it is desirable to have enough information about its performance. Several methods are used to obtain information about exotic germplasm, such as evaluation of the populations *per se*, populations selfed, diallel mating designs, and topcrosses.

Two approaches have been used to obtain useful populations from exotic sources: adaptive mass selection and intercrossing exotic sources to adapted populations. The first approach results in populations with 100% exotic germplasm, while the second approach produces populations with different proportions of exotic germplasm, depending on the number of backcrosses to the adapted sources (Iglesias, 1989).

Hallauer and Sears (1972) observed that mass selection for early silking in Eto Composite decreased the interval from planting to silking by 20 days, for an average decrease of 3.8 days per cycle of selection. They also observed that a correlated change with mass selection for early silking was an average decrease of 15cm per cycle of selection for ear height. Troyer and Brown (1972), working with three populations containing exotic germplasm, observed that every trait measured had changed significantly with mass selection for early flowering. In a study conducted by Compton et al. (1979) in exotic and Corn Belt x exotic populations, mass selection for adaptation and prolificacy resulted in increases in yield, plant height, and ear height, slight increases in days to flower and ears per plant, and no change in grain moisture at harvest. Results reported by SanVicente (1989) showed that a significant reduction in days to silk and plant height up to the sixth cycle of adaptive mass selection in Antigua Composite; after the third cycle of selection, grain yield remained unchanged.

A theoretical model was developed by Dudley (1982) to evaluate methods for incorporation of favorable alleles governing quantitative traits from exotic germplasm into adapted populations. He concluded that the optimum generation to be used as the foundation population is a function of the genetic diversity of the parents. If one of the parents used in the cross is an exotic germplasm, at least one backcross to the adapted parent was recommended. A simulation study was conducted by Bridges and Gardner (1987). They concluded that the $F_2$ population was better for both long-term and short-term selection goals when the adapted and exotic populations perform the same; one backcross to the adapted population ($BC_1$) was better for short-term goals when the adapted population was superior; the $BC_1$ was better for long-term goals when the adapted population was superior due to a greater number of loci with favorable alleles present; and the $F_2$ is better for long-term goals when the adapted population is superior due to the presence of favorable alleles at loci with large effects. Data from field experiments have demonstrated that populations with 25 to 50% exotic germplasm do not differ significantly in yield from the adapted source and have greater genetic variability (Sallah, 1984; Crossa and Gardner, 1987; Albretch and Dudley, 1987).

Delayed floral initiation and excessive vegetative growth under U.S. Corn Belt conditions are two characteristics easily found in tropical and subtropical germplasm. Troyer and Brown (1972) emphasized that early generation selection for fast maturity in populations derived from crosses of exotic x adapted germplasm may result in simply sorting out the adapted germplasm. According to Hallauer (1978) that problem could be solved by practicing direct adaptive selection in productive exotic gene pools. An example is the development of BS16 from ETO Composite.

Holley and Goodman (1988) obtained inbred lines from 100% tropical germplasm that produced agronomically competitive testcrosses with elite Southern U.S. lines. Goodman (1985) derived 36 populations from a diallel mating among nine tropical hybrids. Topcross evaluation with B73 showed many populations did not differ from the commercial hybrids. Stuber (1986), studying testcrosses and their reciprocals, observed not only that 100% exotic populations had an excellent genetic potential, but also that exotic germplasm could be an interesting source of cytoplasmic genetic variation for production traits. Hallauer (1978) emphasized that the yield of the populations crossed to the tester is the average performance of exotic genotypes by the tester. If a normal distribution of testcrosses within the population is assumed, lines could be isolated that have superiority in combination with the tester line.

The diallel mating design has been useful for the evaluation and genetic analysis of exotic populations. The method is based on the assumption of a linear relationship between genetic divergence of the involved populations and heterosis (Richey, 1922; Moll et al., 1962). The range over which such an assumption is valid is sometimes restricted. Data obtained from diallel mating design can be used to estimate genetic distances and to classify populations into different heterotic groups (Iglesias, 1989).

Troyer and Hallauer (1968) studied a diallel set of 10 early flint varieties of diverse geographic origin and concluded that they were also extremely diverse genetically, based on the higher levels of observed heterosis. In a diallel involving populations with 25 to 50% exotic germplasm, Eberhart (1971) concluded that most of the variation among populations and population crosses could be explained by the variety effects.

A diallel among six populations (three adapted and three exotic) was developed by Gerrish (1983). He observed that the exotic population crosses exhibited limited heterosis and rarely equalled Corn Belt x Corn Belt crosses. Mungoma and Pollak (1988) studied diallel crosses among 10 populations and found that BSSS(R)C10 combined best with the Mexican Dent population, which was significantly higher yielding than BSSS(R)C10 x Lancaster Sure Crop but not different from the check, B73 x Mo17.

Recurrent selection seems to offer the best selection procedures needed for adapting exotic germplasm. Initially, simple mass selection may be satisfactory for highly heritable traits, such as flowering, plant and ear height, and disease and insect resistance. More complex procedures would be needed for increasing gene frequencies for yield and other traits (e.g., stalk quality) for modern maize production (Hallauer, 1978).

A $S_2$ recurrent selection program that emphasized yield in populations with different proportions of exotic germplasm was initiated in 1971 at Iowa State University (Hallauer, 1978). The relative proportions of exotic germplasm were 100%, 50%, 25%, and 0% for BS16 (ETO Composite selected for adaptation), BS2 (ETO Composite crossed with six early lines), BSTL (Lancaster x Tuxpeno backcrossed to Lancaster), and BSK (Krug open-pollinated variety), respectively. Estimates of components of variance indicated that the expected performance of selected genotypes from exotic or semiexotic germplasm would be comparable to those obtained in adapted germplasm. Hallauer (1980) showed that the estimates of the $S_2$ progeny components of variance for yield presented a trend related to the relative increments of exotic germplasm. Rodriguez (1986) observed a reverse trend in terms of realized response to selection. Response in BS2 and BSTL after four cycles of $S_2$ recurrent selection was 3.07 and 2.97 q/ha per cycle, respectively, and response in BS16 after three cycles was 1.73 q/ha.

After three cycles of $S_2$ recurrent selection for BS2 and BSTL, and two cycles for BS16, preliminary evaluations were conducted in 1981. The rate of improvement was 2.90 and 2.46 q/ha per cycle for BS2 and BSTL, respectively, and a loss of 4.70 q/ha per cycle for BS16 (Iglesias, 1987). After correcting for inbreeding depression, adjusted gains were more related to the original expected gains.

The rates of response obtained by Iglesias and Hallauer (1989) in BS2 and BSTL after five cycles of $S_2$ recurrent selection were 2.65 and 1.16 q/ha per cycle respectively, and BS16 after four cycles of $S_2$ recurrent selection decreased 2.5 q/ha per cycle. According to the authors, the unexpected response in BS16 was the result of abnormal conditions in the initial cycle of selection that drastically changed the genetic variability of the population and reduced the range of useful variation to improve grain yield under normal conditions. Good combining ability with BSSS was observed when the same populations were evaluated in topcrosses (Iglesias and Hallauer, 1989; Mungoma and Pollak, 1988). Genetic gains, however, have been obtained in populations having 25 to 50% exotic germplasm; this proportion of exotic germplasm is coincident with what is usually recommended in the literature (Iglesias, 1989).

Exotic germplasm must include useful genes, but they will not be available until they are incorporated with highly productive adapted germplasm (Hallauer and Miranda, 1981). As Duvick (1981) stated: "we do not need diversity of deleterious genes; we do need to learn how to identify useful gene combination in exotic materials, and how to transfer them efficiently and quickly." Unadapted accessions with useful genes, once identified, can be utilized directly for extracting lines for a hybrid breeding program or in a population improvement program (Hallauer and Miranda, 1981).

# SECTION I: EVALUATION OF EXOTIC AND ADAPTED MAIZE (*Zea mays* L.) GERMPLASM CROSSES

## ABSTRACT

Exotic germplasm may be used to increase the genetic variability in the U.S. maize populations. The objectives of this study were to determine the relative performance of exotic germplasm to two widely used U.S. Corn Belt populations, to determine the proportions of exotic to adapted germplasm that exhibited superior performance, and to determine the heterotic patterns between the exotic populations and the two widely used Corn Belt populations. A 13x13 simple lattice design was used and the study was conducted in seven Iowa environments. The treatments included the adapted (0% exotic) and exotic germplasm (100% exotic), the crosses (50% exotic) and backcrosses (75% or 25% exotic germplasm) between them, and the check varieties.

The results for grain yield (q/ha) suggest that the best percentage of exotic germplasm used was 50%. Exceptions were observed in the crosses of Cateto by BS26 (51.5 q/ha), Caribbean Flint by BS26 (56.1 q/ha), where the highest yield was observed for no exotic germplasm, BS26 (57.1 q/ha), and in the cross of Tuxpeño by BS26, where the highest yield was observed for the treatment with 25% exotic germplasm (58.8 q/ha). Suwan 1 and Tuxpeño exotic germplasms have greater potential for continuing development. Both germplasms had mild selection for adaptation in the U.S. Corn Belt compared with the other exotic germplasms. Despite no selection for adaptation and without considering the reciprocal crosses, the crosses Tuxpeño by BS13 (72.0 q/ha) and BS13 by Suwan 1 (69.1 q/ha), ranked fourth and fifth in the treatments per se, where the top ranked treatment was the

cross of BSSS(R)C11 by BSCB1(R)C11 (79.4 q/ha). Higher values for midparent heterosis and coefficient of determination were observed when either Tuxpeño or Suwan 1 were crossed with BS13 and Suwan 1 was crossed with BS26. Overall, BS13(S)C4 combined better with the exotic germplasms than did BS26. With the results observed, the heterotic pattern Suwan 1 by Tuxpeño is suggested for exotic sources.

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Index words: *Zea mays* L., exotic germplasm, adapted germplasm, introgression

# INTRODUCTION

In the early maize (*Zea mays* L.) breeding programs, populations for the extraction of lines were generally open-pollinated varieties developed by maize breeders and growers who chose an ear type considered ideal by scorecard standards (Hallauer and Eberhart, 1966). In the 1920s the first commercial hybrids produced and sold were almost exclusively double crosses. In the late 1950s a transition from double crosses to single crosses occurred in the U.S. Corn Belt. Improved agronomic practices and inbreds with higher per se yields made the production of seed of single crosses economically feasible (Wych, 1988). It was found that single crosses outyielded double crosses. A few companies produced and sold single crosses, and others joined them to be competitive. Farmers began to demand single crosses because of their higher yields and uniformity in maturity. Today, maize hybrids sold in the U.S. Corn Belt are being developed from a relatively narrow germplasm base. Some authors have expressed concerns about the narrow genetic base, specially after the southern corn leaf blight [incited by *Bipolaris maydis* (Nisikado) Shoemaker, race T] epidemic in the early 1970s (Eberhart, 1971; National Academy of Science, 1972; Lonnquist, 1974; Brown, 1975; Crossa and Gardner, 1987). According to Brown (1975), the maize breeding programs in the United States have been devoted mainly to germplasm whose origin trace to only 3 of 130 existing races.

The use of exotic germplasm for the improvement of maize in the U.S. Corn Belt has been suggested (Wellhausen, 1965; Hallauer, 1978;

Geadelmann, 1984). Albrecht and Dudley (1987) proposed some reasons for the use of exotic germplasm in the U.S. maize breeding programs: the need for increased genetic diversity as a safeguard against unpredictable biological and environmental hazards, as a source of genes for specific traits such as disease, pest, and stress resistance, and as a source of favorable alleles for yield to increase useful genetic variation and to enhance heterosis. Until now, the use of exotic germplasm in maize breeding programs has been limited. Perhaps, this limitation can be attributed more to poor choices of populations than to the choices of breeding schemes employed (Goodman, 1985).

The objectives of this study were 1) to determine the relative performance of exotic populations to two widely used U.S. Corn Belt populations; 2) to determine the proportions of exotic to adapted populations that exhibited superior performance; and 3) to determine the heterotic patterns between the exotic populations and the two widely used U.S. Corn Belt populations.

# MATERIALS AND METHODS

This study includes two adapted and seven exotic germplasm sources. The exotic germplasm was adapted to temperate areas by selection for earlier flowering. The adapted germplasm sources used in this study included the following:

**BS13** - A population developed from 'Iowa Stiff Stalk Synthetic' (BSSS) by seven cycles of half-sib recurrent selection for yield. Half-sib selection was initiated in BSSS in 1939 with the double cross Ia13[(L317xBL239) x (BL345xMC401)] used as the tester and the population was designated as BSSS(HT). After seven cycles of half-sib selection, $S_2$ line recurrent selection was initiated and the half-sib program was discontinued. BSSS(HT)C7 was renamed as BS13(S)C0, the population for $S_2$ recurrent selection (Hallauer and Smith, 1979). The material used in this study was one after four cycles of $S_2$ recurrent selection [BS13(S)C4]. In this paper, BS13(S)C4 will be referred only as BS13.

**BS26** - A population developed by crossing 15 inbred lines with BSL(HI)C5, BSL(S)C6, and BSTL(S)C2. The 15 inbred lines were B70, C103, C123, Mo17, N13, Oh43, Oh517, Va20, Va44, Va58, Va59, Va60, Va61, and Va36. Each inbred line was crossed with approximately 25 plants within each of the three synthetic cultivars. Equal quantities of seed from each pollination were composited to form a 500-kernel bulk, which was random mated once and designated as 'Lancaster Composite A'. A second composite was formed by crossing six inbred lines (C103, C123, Mo17, Oh43, Va35) carrying the genes *Ht, Ht2, Ht3* (*Helminthosporium turcicum* resistance), and *rhm* (*Helminthosporium maydis* resistance) to 25 plants of BS12(HI)C7, 'Nebraska Cattlecorn', and Lancaster Composite A. Equal quantities of seed from each ear were composited to form a 1000-kernel bulk that was random mated to form 'Lancaster Composite B'. Equal quantities of seed were composited from Lancaster Composite A and Lancaster Composite B and planted in a 0.4ha isolation for random mating. Five thousand ears from the isolation were harvested without selection, shelled, and thoroughly mixed. Sixteen hundred and thirty six $S_1$ lines were derived from this population and screened for several traits. Based on the screening trials 50 $S_2$ lines were selected for recombination and then random mated once following recombination. The resulting population was designated as BS26 (Hallauer, 1986).

These two sources were chosen because Reid Yellow Dent, represented by BS13, and Lancaster Sure Crop, represented by BS26, are included in over 60% of the hybrids grown in the U.S. Corn Belt (Smith, 1988).

The exotic germplasm sources included in this study are as follows:

**Cateto** - Cateto includes six proprietary Argentine flint inbreds. One inbred contained 12.5% early Corn Belt germplasm (Gerrish, 1983);

**Caribbean Flint** - This is a race from the Caribbean area. One Costeño, one Eto, and four Coastal Yellow Flint inbreds were converted to central U.S. Corn Belt adaptation by crossing to very early U.S. Corn Belt inbreeds and/or single crosses and backcrossing twice to tropical inbreds (Gerrish, 1983).

**Mexican Dent** - One Celaya and five Tuxpeno inbreds were converted to central U.S. Corn Belt maturity by crossing to very early U.S. Corn Belt inbreds and/or single crosses and backcrossing twice to tropical inbreds (Gerrish, 1983).

**Antigua** - Antigua is a Caribbean variety and is one of the best sources of tropical maize germplasm known today. It is highly resistant to many diseases and insects and has excellent yield potential (Pollak, 1985). Because of its tropical origin, it is very late and tall when grown in central Iowa conditions (Hallauer and Sears, 1976).

Adaptive mass selection was initiated in Antigua Composite in 1978. An isolation plot about 0.4ha was planted with seed obtained from Dr. Elmer Johnson of the CIMMYT maize program. On August 8 and 10, 1978, 300 plants were tagged that had silks on the top-ear shoots. No subplots were developed within the isolation field. All ears on tagged plants were harvested and dried to about 15.5% grain moisture in forced-air dryers. Equal quantities of seed were bulked from each ear to form the cycle 1 population. The procedure for mass selection for earlier silk emergence was the same in each cycle, except that the date of tagging was earlier in successive cycles (SanVicente, 1989).

**BS16** - This population was developed by six cycles of mass selection for adaptiveness in 'ETO Composite' introduced from Colombia (Hallauer and Sears, 1972). BS16 is adapted to central Iowa, and its resistance to feeding by first- and second-generation European corn borer (*Ostrinia nubilalis* Hübner) is above average. BS16 is characterized by vigorous plants with large tassels and considerable leaf pubescence, and ears with semi-dent kernels that range from light yellow to light orange. BS16 is of

U.S. Corn Belt maturity and includes germplasm different from that currently used in most breeding populations (Hallauer and Smith, 1979).

**Suwan 1** - It is a population introduced from Thailand and includes primarily Cuban Flint germplasm. Two years of selection for earlier flowering was done in Suwan 1 prior to its use in this study.

**Tuxpeño** - This is an adapted strain from Mexico. It is of great importance in the tropics. Tuxpeño is basically the product of the hybridization of Olotillo and Tepecintle races which have overlapping distributions (Wellausen et al., 1952). The seeds used in this study were originated from Dr. Elmer Johnson of the CIMMYT maize program. Working in Mexico, Dr. Johnson conducted 15 cycles of visual full-sib recurrent selection for reduced plant height in Tuxpeño (Johnson et al., 1986). Two years of selection for earlier flowering was performed in Tuxpeño prior to its use in this study.

In the summer 1987, each of the seven exotic germplasm sources were crossed to BS13 and BS26. In the summer 1988 each cross was backcrossed to the parents included in the crosses. Eight paired rows of 25 plants per row were used to produce the crosses and backcrosses. Every attempt was made to pollinate each plant within each row. Each tassel was used to pollinate no more than two ear shoots. To prevent further use, the tassels were broken after two pollinations. Crosses and backcrosses were made using the parents in all possible ways: for example, $P_1xP_2$; $(P_1xP_2)xP_1$; $P_1x(P_1xP_2)$; $(P_1xP_2)xP_2$; $P_2x(P_1xP_2)$; $P_2xP_1$; $(P_2xP_1)xP_1$; $P_1x(P_2xP_1)$; $(P_2xP_1)xP_2$; and $P_2x(P_2xP_1)$, where $P_1$ was the adapted germplasm and $P_2$ was the exotic germplasm source. Then, they were hand harvested and bulked within each row. The ears were dried to 15.5% grain moisture. Each row was shelled separately in bulk, thoroughly mixed, and a sample was taken from each cross for the evaluation trials. Genetic materials, therefore, were available that included zero (BS13 and BS26), 25% (backcrosses to BS13 or BS26), 50% (crosses), 75% (backcrosses to exotic germplasm), and 100% exotic germplasm.

The parents, crosses, backcrosses, and checks were included in this study. The experiments were conducted at four locations in Iowa (Ames Agronomy and Agricultural Engineering Research Center, Ames Atomic Energy Farm, Martinsburg, and Crawfordsville) in 1989 and 1990. At each location a 13x13 simple lattice field design with 169 entries was used. The experimental unit was a two-row plot that was 5.49m (18 feet) long, with 76.2cm (30 inches) between rows. In both years the experiments were machine planted between the last two weeks of April and the first two weeks of May. The experiment in Martinsburg in 1989 was an exception because it was planted in late May. The plots were overplanted and thinned to 52 plants/plot (62,150 plants/ha). Conventional fertilization and weed control were used at all locations. The experiments were machine harvested.

In all experiments in both years data were collected for stand (plants/ha), root lodging (%, proportion of total plants leaning more than 30° from vertical), stalk lodging (%, proportion of total plants broken at ear node or below), dropped ears (%, proportion of total ears not attached to the plant), grain yield (q/ha at 15.5% grain moisture), and grain moisture (%). For the experiments located at Ames Agronomy Research Center and Ames Atomic Energy Farm, days to anthesis (days from planting to 50% of the plants shedding pollen) and ear height (cm, measured in 10 competitive plants from ground level to upper ear node) data were collected. Because of severe lodging at Crawfordsville in 1989, the experiment was discarded.

Analysis of variance (Anova) was conducted for each experiment at each environment (year and location) and combined over environments. Environments were considered as random effects while treatments were considered fixed effects in the analysis of variance. The treatments sum of squares, with 168 degrees of freedom, were partitioned into orthogonal contrasts to evaluate the significance of the single crosses, backcrosses, parents, checks, single crosses versus backcrosses, single crosses and backcrosses versus the parents, and single crosses, backcrosses, and parents versus checks. Further, the single crosses, with 29 degrees of freedom, and the backcrosses, with 119 degrees of freedom, were partitioned in all possible combinations to evaluate the crosses and backcrosses among the adapted and exotic germplasm sources. The pooled error mean squares were used to test for significance of genotype by environment interaction mean squares, and the genotype mean squares were tested with the genotype by environment interaction mean squares (Table 1).

The changes in performance of the crosses among adapted by exotic germplasms with different percentages of exotic germplasm were evaluated assuming a quadratic relationship between them. The sum of squares due to the regression equations that relate performance of the crosses among adapted by exotic germplasm to different percentages of exotic germplasm over all environments were calculated using the following model:

$$Y_i = b_o + b_1x_i + b_qx_i^2 + e_i,\text{ where}$$

$_i$ = 0%, 25%, 50%, 75%, and 100% exotic germplasm;

$Y_i$ = mean of the $i^{th}$ percentage of exotic germplasm;

$b_o$ = linear regression coefficient;

$b_q$ = quadratic regression coefficient;

$x_i$ = percentage of exotic germplasm corresponding to the $i^{th}$ percentage, and

$e_i$ = residual.

Table 1 - Form of the analysis of variance combined over environments

| Source of variation | df[a] | Expected mean squares |
|---|---|---|
| Environments (E) | e-1 | $\sigma^2 + g\sigma^2_{r/e} + rg\sigma^2_e$ |
| Replications/E | e(r-1) | $\sigma^2 + g\sigma^2_{r/e}$ |
| Treatments (G) | g-1 | $\sigma^2 + r\sigma^2_{ge} + re\phi^2_g$ |
| G x E | (e-1)(g-1) | $\sigma^2 + r\sigma^2_{ge}$ |
| Pooled Error | e(r-1)(g-1) | $\sigma^2$ |

[a] e, r, and g refer to number of environments (e=7), replications (r=2), and treatments (g=169) respectively.

# RESULTS AND DISCUSSION

The efficiency of lattice design analysis for each environment was 5% relative to the randomized complete block design. There was no gain in efficiency with the use of the lattice design in 50% of the traits and environments. In the combined analysis of variance over environments, the degrees of freedom for the source of variation for block effects were included in the pooled error, and adjusted means were used in the analyses. The mean squares for the combined analysis of variance across environments for the traits evaluated are presented.

Treatments and treatments x environment interaction mean squares were highly significant ($P \leq 0.01$) for grain yield and grain moisture (Table 2). Differences of treatment sum of squares for yield were highly significant among single crosses, backcrosses, parents, checks, single cross versus backcrosses, and single cross plus backcross versus parents. Highly significant differences were detected in the single-cross comparisons for crosses to BS13, crosses to BS26, BS13 versus BS26, and crosses to BS13 when using BS13 as female parent. Differences among backcrosses to BS13 and BS26 were highly significant. Further partition of the crosses to BS13 and BS26 indicated highly significant differences for BS13 when used as a female parent, exotic germplasm when used as either male or female parent in crosses with BS13, BS13 versus exotic germplasm, exotic germplasm when used as either male or female parent in crosses with BS26, and BS26 versus exotic germplasm. Significant at the 5% level was observed for among single crosses using BS26 as male parent, single crosses using BS26 as male

Table 2. Mean squares of combined analysis of variance for grain yield (q/ha) and moisture (%) evaluated in seven environments

| Source | df | Grain Yield | Grain Moisture |
|---|---|---|---|
| Environments(E) | 6 | 17,914.09 | 4,022.77 |
| Replications/E | 7 | 3,960.79 | 122.21 |
| Treatments | 168 | 699.75** | 94.92** |
| Among single crosses(SC) | 29 | 381.27** | 53.81** |
| Crosses to BS13 | 14 | 354.88** | 58.57** |
| BS13 as male(A) | 7 | 367.40 | 56.40** |
| BS13 as female(B) | 6 | 361.53** | 70.85** |
| A vs B | 1 | 227.39 | 0.16 |
| Crosses to BS26 | 14 | 285.15** | 52.89** |
| BS26 as male(C) | 7 | 266.71* | 41.77** |
| BS26 as female(D) | 6 | 209.26 | 73.98** |
| C vs D | 1 | 869.62* | 4.27 |
| BS13 vs BS26 | 1 | 2,096.30** | 0.05 |
| Among backcrosses(BC) | 119 | 370.02** | 96.27** |
| Crosses to BS13 | 59 | 399.82** | 101.68** |
| BS13 as male(F) | 15 | 159.96* | 27.28** |
| BS13 as female(G) | 15 | 369.90** | 12.35** |
| Exotic as male(H) | 13 | 410.13** | 155.98** |
| Exotic as female(I) | 13 | 406.89** | 202.20** |
| F vs G | 1 | 130.25 | 2.03 |
| H vs I | 1 | 132.40 | 5.62 |
| BS13 vs exotic | 1 | 4,772.79** | 740.89** |
| Crosses to BS26 | 59 | 338.28** | 90.97** |
| BS26 as male(J) | 15 | 144.38 | 14.58* |
| BS26 as female(K) | 15 | 155.48* | 12.88** |
| Exotic as male(L) | 13 | 246.18** | 138.23** |
| Exotic as female(M) | 13 | 212.65** | 218.17** |
| J vs K | 1 | 33.84 | 18.43* |
| L vs M | 1 | 58.43 | 0.20 |
| BS26 vs exotic | 1 | 9,403.63** | 303.44** |
| BS13 vs BS26 | 1 | 484.76 | 90.05* |
| Among parents | 8 | 1,699.26** | 305.73** |
| Among checks | 9 | 1,898.78** | 35.40** |
| (SC vs BC) | 1 | 12,359.69** | 12.75* |
| (SC+BC) vs parents | 1 | 19,355.60** | 62.64 |
| (SC+BC+parents) vs checks | 1 | 70.26 | 90.35* |

*, ** Significant at the 0.05 and 0.01 levels, respectively.

Table 2. (Continued)

| | | | |
|---|---|---|---|
| Treatments x E | 1008 | 97.86** | 6.95** |
| Among single crosses(SC) x E | 174 | 111.95** | 5.43** |
| Crosses to BS13 x E | 84 | 120.73** | 6.17** |
| BS13 as male(A) x E | 42 | 170.25** | 4.86* |
| BS13 as female(B) x E | 36 | 76.11 | 8.05** |
| A vs B x E | 6 | 41.83 | 4.07 |
| Crosses to BS26 x E | 84 | 102.60* | 4.46** |
| BS26 as male(C) x E | 42 | 94.77 | 3.64 |
| BS26 as female(D) x E | 36 | 115.68* | 5.60** |
| C vs D x E | 6 | 78.97 | 3.35 |
| BS13 vs BS 26 x E | 6 | 120.00 | 8.57* |
| Among backcrosses(BC) x E | 714 | 95.03** | 6.96** |
| Crosses to BS13 x E | 354 | 98.44** | 6.62** |
| BS13 as male(F) x E | 90 | 89.56** | 2.37 |
| BS13 as female(G) x E | 90 | 95.66 | 2.59 |
| Exotic as male(H) x E | 78 | 116.36** | 10.25** |
| Exotic as female(I) x E | 78 | 84.64 | 9.61** |
| F vs G x E | 6 | 151.56 | 2.80 |
| H vs I x E | 6 | 70.83 | 3.34 |
| BS13 vs exotic x E | 6 | 194.37* | 51.58** |
| Crosses to BS26 x E | 354 | 83.70 | 7.19** |
| BS26 as male(J) x E | 90 | 99.48* | 7.27** |
| BS26 as female(K) x E | 90 | 85.46 | 1.71 |
| Exotic as male(L) x E | 78 | 65.95 | 7.35** |
| Exotic as female(M) x E | 78 | 86.08 | 12.77** |
| J vs K x E | 6 | 59.08 | 1.98 |
| L vs M x E | 6 | 47.15 | 6.87* |
| BS26 vs exotic x E | 6 | 81.63 | 19.30** |
| BS13 vs BS26 x E | 6 | 561.98** | 14.02** |
| Among parents x E | 48 | 77.70 | 15.74** |
| Among checks x E | 54 | 78.39 | 3.80 |
| (SC vs BC) x E | 6 | 84.08 | 1.22 |
| (SC+BC) vs parents x E | 6 | 291.97** | 11.79** |
| (SC+BC+parents) vs checks x E | 6 | 182.93* | 7.44* |
| Pooled error | 1176 | 78.64 | 3.17 |
| General mean | | 55.13 q/ha | 20.98% |
| Coefficient of variation (%) | | 16.09 | 8.49 |

parent versus using BS26 as female parent, among backcrosses using BS13 as male parent, and among backcrosses using BS26 as female parent.

Treatment by environment interactions were highly significant among single crosses by environment, among backcrosses by environment, and single crosses plus backcrosses versus parents by environment. The source of variation for single crosses, backcrosses, and parents versus checks by environment interaction was significant at the 5% level. The partition of the among single crosses by environment interactions were highly significant for crosses to BS13 by environment and using BS13 as male parent by environment. Crosses to BS26 by environment interaction and using BS26 as female parent by environment interaction were significant. The partition of among backcrosses by environment interactions were highly significant for crosses with BS13 by environment, using BS13 as male parent by environment, crosses to BS13 using exotic germplasm as male parent by environment, and BS13 versus BS26 by environment. BS13 versus exotic germplasm by environment and crosses to BS26 used as male parent by environment were significant.

Treatments and treatments by environment interaction were highly significant for the root and stalk lodging (Table 3). For stand and dropped ears, treatment mean squares were highly significant, but treatment by environment interaction was highly significant only for stand (Table 4). Treatments were highly significant for ear height and days-to-anthesis (Table 5). The treatment by environment interaction was highly significant only for days-to-anthesis. No significance was

Table 3. Mean squares for combined analysis of variance for root (%) and stalk lodging (%) evaluated in seven environments

| Source | df | Lodging Root | Stalk |
|---|---|---|---|
| Environments(E) | 6 | 12,496.87 | 4,273.87 |
| Replications/E | 7 | 3,007.01 | 2,681.61 |
| Treatments | 168 | 60.32** | 111.99** |
| Among single crosses(SC) | 29 | 44.51 | 99.13** |
| Crosses to BS13 | 14 | 57.03 | 91.14** |
| BS13 as male(A) | 7 | 39.40 | 81.17* |
| BS13 as female(B) | 6 | 85.84 | 73.49 |
| A vs B | 1 | 7.64 | 266.77* |
| Crosses to BS26 | 14 | 18.19 | 110.93** |
| BS26 as male(C) | 7 | 20.05 | 83.77 |
| BS26 as female(D) | 6 | 15.80 | 160.99** |
| C vs D | 1 | 19.57 | 0.65 |
| BS13 vs BS26 | 1 | 237.60 | 45.78 |
| Among backcrosses(BC) | 119 | 55.53** | 98.15** |
| Crosses to BS13 | 59 | 49.71* | 91.53** |
| BS13 as male(F) | 15 | 24.81 | 38.36 |
| BS13 as female(G) | 15 | 37.14 | 86.68** |
| Exotic as male(H) | 13 | 64.79 | 120.20** |
| Exotic as female(I) | 13 | 75.58 | 141.61** |
| F vs G | 1 | 6.60 | 10.71 |
| H vs I | 1 | 20.46 | 0.04 |
| BS13 vs exotic | 1 | 151.73* | 110.00 |
| Crosses to BS26 | 59 | 55.69** | 105.40** |
| BS26 as male(J) | 15 | 19.68* | 93.24** |
| BS26 as female(K) | 15 | 19.90 | 70.20 |
| Exotic as male(L) | 13 | 74.02* | 104.86** |
| Exotic as female(M) | 13 | 67.76* | 172.68** |
| J vs K | 1 | 17.33* | 0.01 |
| L vs M | 1 | 1.57 | 0.94 |
| BS26 vs exotic | 1 | 829.86 | 158.20 |
| BS13 vs BS26 | 1 | 389.23 | 61.17 |
| Among parents | 8 | 144.80** | 188.46** |
| Among checks | 9 | 93.64 | 271.80** |
| (SC vs BC) | 1 | 1.79 | 74.69 |
| (SC+BC) vs parents | 1 | 87.04 | 143.88 |
| (SC+BC+parents) vs checks | 1 | 144.66* | 87.55 |

*, ** Significant at the 0.05 and 0.01 levels, respectively.

Table 3. (Continued)

| | | | |
|---|---|---|---|
| Treatments x E | 1008 | 33.47** | 38.61** |
| Among single crosses(SC) x E | 174 | 32.63** | 36.85 |
| Crosses to BS13 x E | 84 | 39.82** | 39.52 |
| BS13 as male(A) x E | 42 | 43.60** | 27.28 |
| BS13 as female(B) x E | 36 | 40.35** | 53.91** |
| A vs B x E | 6 | 10.08 | 38.96 |
| Crosses to BS26 x E | 84 | 18.15 | 33.65 |
| BS26 as male(C) x E | 42 | 17.93 | 42.27 |
| BS26 as female(D) x E | 36 | 20.04 | 25.96 |
| C vs D x E | 6 | 8.32 | 19.50 |
| BS13 vs BS 26 x E | 6 | 134.70** | 44.04 |
| Among backcrosses(BC) x E | 714 | 30.55** | 39.18** |
| Crosses to BS13 x E | 354 | 34.88** | 34.39 |
| BS13 as male(F) x E | 90 | 21.18 | 28.07 |
| BS13 as female(G) x E | 90 | 41.29** | 33.73 |
| Exotic as male(H) x E | 78 | 38.77** | 30.91 |
| Exotic as female(I) x E | 78 | 43.60** | 42.45* |
| F vs G x E | 6 | 1.97 | 37.46 |
| H vs I x E | 6 | 24.79 | 20.09 |
| BS13 vs exotic x E | 6 | 23.25 | 90.59** |
| Crosses to BS26 x E | 354 | 23.69 | 38.33* |
| BS26 as male(J) x E | 90 | 9.72 | 38.71 |
| BS26 as female(K) x E | 90 | 13.86 | 39.90 |
| Exotic as male(L) x E | 78 | 34.07* | 27.89 |
| Exotic as female(M) x E | 78 | 32.54* | 45.72** |
| J vs K x E | 6 | 2.11 | 21.85 |
| L vs M x E | 6 | 2.94 | 38.82 |
| BS26 vs exotic x E | 6 | 172.99** | 64.25 |
| BS13 vs BS26 x E | 6 | 180.33** | 372.85** |
| Among parents x E | 48 | 45.59** | 37.12 |
| Among checks x E | 54 | 64.42** | 38.96 |
| (SC vs BC) x E | 6 | 15.71 | 43.06 |
| (SC+BC) vs parents x E | 6 | 68.09* | 25.47 |
| (SC+BC+parents) vs checks x E | 6 | 13.13 | 38.76 |
| Pooled error | 1176 | 24.46 | 32.32 |
| General mean | | 4.50 % | 11.42% |
| Coefficient of variation (%) | | 109.90 | 49.78 |

observed for the source of variation for treatment by environment interaction for dropped ears (Table 4) and ear height (Table 5).

The results for grain yield suggest that the best percentage of exotic germplasm was 50% (the $F_1$ hybrids of crosses among adapted by exotic germplasm) (Table 6). Exceptions were observed in the crosses of Cateto by BS26 (51.5 q/ha), Caribbean Flint by BS26 (56.1 q/ha), where the highest yield was observed for no exotic germplasm, BS26 (57.1 q/ha), and in the cross of Tuxpeño by BS26, where the highest yield was observed for the treatment with 25% exotic germplasm (58.8 q/ha). The better performance of the $F_1$ hybrids can be attributed to the hybrid vigor resulting from the genetic diversity of the exotic and adapted populations.

The pattern for percentage of exotic germplasm was not the same for the other traits (Table 6). For grain moisture when using BS13 as the adapted germplasm, the lowest value was observed for the adapted germplasm (18.9%). Only when BS13 was crossed to Mexican Dent did the exotic germplasm show a lower value (18.5%). In the cross BS16 by BS13, the exotic germplasm, BS16, had the same value (18.9%) as BS13. BS26 had a higher grain moisture (20.77%) in its crosses with exotic germplasm, with the exceptions for Suwan 1 (32.7%) and for Tuxpeño (25.9%). Highest grain moistures were observed for Suwan 1 and Tuxpeño exotic germplasm sources per se. The higher grain moistures for Suwan 1 and Tuxpeño were likely because they were later populations and the experiments in 1990 were harvested earlier than normal. For root and stalk lodging, BS13 with 50% exotic germplasm presented most of the values between the exotic and the adapted germplasm. Crosses of Mexican Dent by BS13 (6.0%) and Tuxpeno by

Table 4. Mean squares for combined analysis of variance for stand (m/ha) and dropped ears (%) evaluated in seven environments

| Source | df | Stand | Dropped ears |
|---|---|---|---|
| Environments(E) | 6 | 1,379.99 | 74.16 |
| Replications/E | 7 | 259.13 | 41.10 |
| Treatments | 168 | 38.77** | 1.91** |
| Among single crosses(SC) | 29 | 30.95* | 1.96 |
| Crosses to BS13 | 14 | 11.85 | 1.74** |
| BS13 as male(A) | 7 | 13.52 | 2.51** |
| BS13 as female(B) | 6 | 11.81 | 0.46 |
| A vs B | 1 | 0.42 | 4.05 |
| Crosses to BS26 | 14 | 51.34** | 1.99 |
| BS26 as male(C) | 7 | 43.00* | 2.03 |
| BS26 as female(D) | 6 | 65.27* | 1.98 |
| C vs D | 1 | 26.16 | 1.74 |
| BS13 vs BS26 | 1 | 12.88 | 4.75 |
| Among backcrosses(BC) | 119 | 26.59** | 2.05** |
| Crosses to BS13 | 59 | 33.46** | 0.77 |
| BS13 as male(F) | 15 | 14.61 | 0.90 |
| BS13 as female(G) | 15 | 23.82* | 0.52 |
| Exotic as male(H) | 13 | 39.33* | 0.89 |
| Exotic as female(I) | 13 | 42.99** | 0.89 |
| F vs G | 1 | 17.99 | 0.46 |
| H vs I | 1 | 0.59 | 0.25 |
| BS13 vs exotic | 1 | 308.61 | 0.28 |
| Crosses to BS26 | 59 | 19.69** | 2.01 |
| BS26 as male(J) | 15 | 6.53 | 1.99 |
| BS26 as female(K) | 15 | 12.66 | 0.89 |
| Exotic as male(L) | 13 | 29.62* | 3.32* |
| Exotic as female(M) | 13 | 17.39 | 2.32 |
| J vs K | 1 | 0.01 | 0.26 |
| L vs M | 1 | 5.55 | 0.01 |
| BS26 vs exotic | 1 | 257.44* | 1.91 |
| BS13 vs BS26 | 1 | 29.06 | 79.47* |
| Among parents | 8 | 140.00** | 0.67 |
| Among checks | 9 | 22.11 | 1.48 |
| (SC vs BC) | 1 | 22.60 | 0.01 |
| (SC+BC) vs parents | 1 | 1,002.81** | 1.35* |
| (SC+BC+parents) vs checks | 1 | 106.12 | 0.19 |

*, ** Significant at the 0.05 and 0.01 levels, respectively.

Table 4. (Continued)

| | | | |
|---|---|---|---|
| Treatments x E | 1008 | 17.59** | 1.33 |
| Among single crosses(SC) x E | 174 | 19.23** | 1.45 |
| Crosses to BS13 x E | 84 | 17.17** | 0.68 |
| BS13 as male(A) x E | 42 | 15.01 | 0.81 |
| BS13 as female(B) x E | 36 | 17.85* | 0.51 |
| A vs B x E | 6 | 28.15** | 0.84 |
| Crosses to BS26 x E | 84 | 21.63** | 2.14** |
| BS26 as male(C) x E | 42 | 18.17* | 2.34** |
| BS26 as female(D) x E | 36 | 21.88** | 1.88 |
| C vs D x E | 6 | 44.27** | 2.25 |
| BS13 vs BS 26 x E | 6 | 14.67 | 2.41 |
| Among backcrosses(BC) x E | 714 | 14.88** | 1.31 |
| Crosses to BS13 x E | 354 | 17.14** | 0.75 |
| BS13 as male(F) x E | 90 | 13.79 | 0.71 |
| BS13 as female(G) x E | 90 | 12.44 | 0.61 |
| Exotic as male(H) x E | 78 | 19.56** | 0.86 |
| Exotic as female(I) x E | 78 | 18.25** | 0.84 |
| F vs G x E | 6 | 8.45 | 0.47 |
| H vs I x E | 6 | 15.38 | 1.12 |
| BS13 vs exotic x E | 6 | 102.45** | 0.93 |
| Crosses to BS26 x E | 354 | 12.72 | 1.68** |
| BS26 as male(J) x E | 90 | 8.21 | 1.51 |
| BS26 as female(K) x E | 90 | 15.72* | 2.06** |
| Exotic as male(L) x E | 78 | 13.41 | 1.67 |
| Exotic as female(M) x E | 78 | 12.44 | 1.51 |
| J vs K x E | 6 | 12.33 | 2.28 |
| L vs M x E | 6 | 16.52 | 0.49 |
| BS26 vs exotic x E | 6 | 26.74* | 1.48 |
| BS13 vs BS26 x E | 6 | 8.60 | 12.45** |
| Among parents x E | 48 | 47.21** | 0.99 |
| Among checks x E | 54 | 13.98 | 1.68 |
| (SC vs BC) x E | 6 | 28.50* | 0.49 |
| (SC+BC) vs parents x E | 6 | 70.34** | 0.21 |
| (SC+BC+parents) vs checks x E | 6 | 23.65 | 1.40 |
| Pooled error | 1176 | 11.65 | 1.34 |
| General mean | | 58.93 | 0.54 |
| Coefficient of variation (%) | | 5.79 | 214.38 |

Table 5. Mean squares for combined analysis of variance for ear height (cm) and days-to-anthesis (no) evaluated in four environments

| Source | df[a] | Ear height | Days-to-anthesis |
|---|---|---|---|
| Environments(E) | 3 | 63,348.27 | 7,508.35 |
| Replications/E | 4 | 20,383.25 | 82.97 |
| Treatments | 168 | 1,134.05** | 132.60** |
| Among single crosses(SC) | 29 | 1,247.72** | 105.63** |
| Crosses to BS13 | 14 | 960.91** | 94.68** |
| BS13 as male(A) | 7 | 1,030.69** | 104.33** |
| BS13 as female(B) | 6 | 1,015.80** | 97.21** |
| A vs B | 1 | 143.10 | 12.03 |
| Crosses to BS26 | 14 | 1,532.27** | 120.18** |
| BS26 as male(C) | 7 | 1,603.98** | 114.12** |
| BS26 as female(D) | 6 | 1,640.30** | 146.69** |
| C vs D | 1 | 382.03 | 3.49 |
| BS13 vs BS26 | 1 | 1,279.46** | 55.12 |
| Among backcrosses(BC) | 119 | 1,010.32** | 128.87** |
| Crosses to BS13 | 59 | 958.75** | 129.43** |
| BS13 as male(F) | 15 | 162.41** | 41.72** |
| BS13 as female(G) | 15 | 144.08** | 27.96** |
| Exotic as male(H) | 13 | 1,784.13** | 258.65** |
| Exotic as female(I) | 13 | 2,200.96** | 226.91** |
| F vs G | 1 | 10.19 | 16.20** |
| H vs I | 1 | 25.69 | 5.50 |
| BS13 vs exotic | 1 | 126.95 | 257.32** |
| Crosses to BS26 | 59 | 1,076.73** | 121.99** |
| BS26 as male(J) | 15 | 507.06** | 51.76** |
| BS26 as female(K) | 15 | 197.32** | 22.31** |
| Exotic as male(L) | 13 | 1,713.18** | 218.63** |
| Exotic as female(M) | 13 | 2,352.55** | 244.13** |
| J vs K | 1 | 28.26 | 4.50 |
| L vs M | 1 | 33.03 | 0.01 |
| BS26 vs exotic | 1 | 45.50 | 65.73* |
| BS13 vs BS26 | 1 | 133.94 | 502.20* |
| Among parents | 8 | 3,212.97** | 424.49** |
| Among checks | 9 | 693.43** | 16.80** |
| (SC vs BC) | 1 | 582.57 | 117.72** |
| (SC+BC) vs parents | 1 | 1,574.39* | 23.36* |
| (SC+BC+parents) vs checks | 1 | 7.45 | 187.65** |

[a]Ear height and days-to-anthesis were recorded in four environments
*, ** Significant at the 0.05 and 0.01 levels, respectively.

Table 5. (Continued)

| | | | |
|---|---|---|---|
| Treatments x E | 504 | 54.81 | 2.98** |
| Among single crosses(SC) x E | 87 | 49.25 | 4.44** |
| Crosses to BS13 x E | 42 | 43.65 | 4.49** |
| BS13 as male(A) x E | 21 | 40.96 | 6.10** |
| BS13 as female(B) x E | 18 | 50.98 | 2.47 |
| A vs B x E | 3 | 18.49 | 5.29 |
| Crosses to BS26 x E | 42 | 57.80 | 4.21** |
| BS26 as male(C) x E | 21 | 53.40 | 4.30* |
| BS26 as female(D) x E | 18 | 66.45 | 4.59* |
| C vs D x E | 3 | 36.73 | 1.35 |
| BS13 vs BS 26 x E | 3 | 7.81 | 6.98* |
| Among backcrosses(BC) x E | 357 | 51.28 | 2.66 |
| Crosses to BS13 x E | 177 | 45.68 | 2.46 |
| BS13 as male(F) x E | 45 | 47.45 | 1.61 |
| BS13 as female(G) x E | 45 | 37.04 | 1.68 |
| Exotic as male(H) x E | 39 | 39.38 | 4.64** |
| Exotic as female(I) x E | 39 | 57.95 | 2.22 |
| F vs G x E | 3 | 18.11 | 0.25 |
| H vs I x E | 3 | 61.78 | 1.87 |
| BS13 vs exotic x E | 3 | 82.54 | 4.69 |
| Crosses to BS26 x E | 177 | 55.77 | 2.55 |
| BS26 as male(J) x E | 45 | 56.64 | 2.69 |
| BS26 as female(K) x E | 45 | 53.71 | 1.80 |
| Exotic as male(L) x E | 39 | 45.63 | 3.54* |
| Exotic as female(M) x E | 39 | 66.92 | 2.32 |
| J vs K x E | 3 | 27.32 | 0.97 |
| L vs M x E | 3 | 31.14 | 0.34 |
| BS26 vs exotic x E | 3 | 113.48 | 5.57 |
| BS13 vs BS26 x E | 3 | 116.40 | 21.26 |
| Among parents x E | 24 | 89.80 | 2.95 |
| Among checks x E | 27 | 75.93 | 3.14 |
| (SC vs BC) x E | 3 | 189.15* | 0.94 |
| (SC+BC) vs parents x E | 3 | 59.10 | 1.83 |
| (SC+BC+parents) vs checks x E | 3 | 28.17 | 0.53 |
| Pooled error | 672 | 61.52 | 2.41 |
| General mean | | 125.29 | 86.02 |
| Coefficient of variation (%) | | 6.26 | 1.80 |

Table 6. Means for grain yield, grain moisture, stand, root and stalk lodging, dropped ears (calculated over seven environments), ear height and days-to-anthesis (calculated over four environments) for crosses among adapted and exotic germplasm; means for the performance of the crosses of exotic germplasm by BS13 and BS26; and means for the five highest yielding treatments per se

| Treats. | Exotic germ. | Grain Yield | Grain Moist | Stand | Lodging Root | Lodging Stalk | Dropped ears | Ear height | Days-to-anthesis |
|---|---|---|---|---|---|---|---|---|---|
| | % | q/ha | % | M/ha | % | % | % | cm | no. |
| Cateto x | 100 | 35.1 | 19.7 | 57.0 | 5.2 | 13.5 | 0.1 | 101.4 | 79.0 |
| BS13 | 75 | 45.9 | 19.8 | 59.7 | 5.3 | 16.0 | 0.4 | 116.1 | 81.3 |
| | 50 | 55.7 | 20.5 | 58.6 | 3.6 | 14.6 | 0.5 | 124.1 | 83.0 |
| | 25 | 55.6 | 19.5 | 60.3 | 4.3 | 13.7 | 0.3 | 123.2 | 84.8 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Cateto x | 100 | 35.1 | 19.7 | 57.0 | 5.2 | 13.5 | 0.1 | 101.4 | 79.0 |
| BS26 | 75 | 44.8 | 20.1 | 59.3 | 4.3 | 14.5 | 0.7 | 114.3 | 80.9 |
| | 50 | 51.5 | 20.3 | 60.9 | 3.7 | 11.7 | 0.7 | 109.3 | 81.1 |
| | 25 | 55.3 | 20.4 | 59.9 | 2.3 | 13.1 | 0.8 | 121.1 | 82.8 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| Caribbean | 100 | 38.1 | 19.9 | 51.2 | 1.7 | 7.1 | 0.4 | 100.1 | 82.2 |
| Flint x | 75 | 52.9 | 20.2 | 58.5 | 2.0 | 10.7 | 0.3 | 112.4 | 82.3 |
| BS13 | 50 | 61.9 | 20.1 | 59.5 | 2.6 | 11.7 | 0.4 | 124.3 | 83.5 |
| | 25 | 55.1 | 19.5 | 59.5 | 3.5 | 13.1 | 0.3 | 124.3 | 86.9 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Caribbean | 100 | 38.1 | 19.9 | 51.2 | 1.7 | 7.1 | 0.4 | 100.1 | 82.2 |
| Flint x | 75 | 50.2 | 20.1 | 58.6 | 2.9 | 12.3 | 0.4 | 113.3 | 82.5 |
| BS26 | 50 | 56.1 | 20.4 | 59.5 | 3.1 | 10.6 | 0.5 | 113.7 | 82.1 |
| | 25 | 55.4 | 20.2 | 59.9 | 3.0 | 12.3 | 0.6 | 118.9 | 83.7 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| Mexican | 100 | 53.5 | 18.5 | 57.4 | 5.9 | 9.0 | 0.5 | 112.4 | 81.5 |
| Dent x | 75 | 55.9 | 19.8 | 59.6 | 6.8 | 10.5 | 0.4 | 114.1 | 82.5 |
| BS13 | 50 | 64.7 | 18.9 | 59.6 | 6.0 | 10.9 | 0.3 | 121.4 | 83.6 |
| | 25 | 55.5 | 19.2 | 60.6 | 6.1 | 11.8 | 0.5 | 121.6 | 86.3 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Mexican | 100 | 53.5 | 18.5 | 57.4 | 5.9 | 9.0 | 0.5 | 112.4 | 81.5 |
| Dent x | 75 | 53.8 | 19.5 | 60.7 | 5.2 | 11.0 | 0.8 | 114.4 | 82.3 |
| BS26 | 50 | 57.3 | 19.8 | 59.9 | 3.2 | 10.8 | 0.8 | 114.6 | 82.0 |
| | 25 | 56.2 | 20.8 | 59.2 | 3.9 | 13.3 | 1.1 | 120.2 | 83.5 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |

Table 6. (Continued)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Antigua x | 100 | 50.3 | 20.3 | 59.3 | 6.6 | 15.7 | 0.5 | 136.7 | 85.4 |
| BS13 | 75 | 59.3 | 20.5 | 59.2 | 6.9 | 12.3 | 0.6 | 133.8 | 86.2 |
| | 50 | 61.0 | 20.8 | 58.0 | 5.6 | 12.1 | 0.8 | 133.1 | 86.9 |
| | 25 | 55.4 | 19.8 | 59.9 | 4.5 | 12.0 | 0.1 | 126.1 | 88.1 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Antigua x | 100 | 50.3 | 20.3 | 59.3 | 6.6 | 15.7 | 0.5 | 136.7 | 85.4 |
| BS26 | 75 | 53.0 | 20.7 | 59.2 | 4.9 | 14.6 | 1.1 | 132.1 | 85.7 |
| | 50 | 58.2 | 20.1 | 60.7 | 3.2 | 14.0 | 1.2 | 127.7 | 84.5 |
| | 25 | 54.2 | 20.1 | 59.8 | 2.3 | 14.5 | 1.0 | 123.8 | 84.8 |
| | 0 | 57.1 | 20.7 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| BS16 x | 100 | 44.4 | 18.9 | 57.3 | 3.2 | 11.5 | 0.6 | 105.0 | 80.5 |
| BS13 | 75 | 55.2 | 19.0 | 58.8 | 4.1 | 11.3 | 0.4 | 116.8 | 82.8 |
| | 50 | 58.1 | 19.0 | 58.8 | 4.6 | 11.9 | 0.4 | 116.4 | 82.6 |
| | 25 | 56.8 | 19.0 | 58.8 | 3.8 | 11.7 | 0.2 | 121.9 | 86.0 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| BS16 x | 100 | 44.4 | 18.9 | 57.3 | 3.2 | 11.5 | 0.6 | 105.0 | 80.5 |
| BS26 | 75 | 53.9 | 19.3 | 58.3 | 3.2 | 10.8 | 0.9 | 113.3 | 82.1 |
| | 50 | 59.7 | 18.6 | 59.1 | 4.4 | 9.7 | 0.7 | 118.8 | 82.9 |
| | 25 | 57.8 | 19.9 | 60.0 | 2.9 | 10.4 | 0.7 | 122.8 | 83.9 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| Suwan 1 x | 100 | 21.7 | 32.7 | 53.5 | 12.8 | 7.3 | 0.2 | 160.3 | 102.1 |
| BS13 | 75 | 48.0 | 29.3 | 55.0 | 7.5 | 8.9 | 0.1 | 156.2 | 96.9 |
| | 50 | 67.4 | 25.1 | 58.0 | 8.2 | 10.3 | 0.4 | 151.9 | 92.6 |
| | 25 | 60.3 | 22.7 | 58.7 | 5.6 | 10.7 | 0.2 | 134.3 | 91.6 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Suwan 1 x | 100 | 21.7 | 32.7 | 53.5 | 12.8 | 7.3 | 0.2 | 160.3 | 102.1 |
| BS26 | 75 | 49.7 | 29.1 | 57.3 | 8.8 | 9.5 | 0.5 | 156.1 | 95.7 |
| | 50 | 63.5 | 24.7 | 58.5 | 4.7 | 10.5 | 0.4 | 149.4 | 92.6 |
| | 25 | 60.7 | 22.7 | 59.4 | 3.3 | 10.2 | 0.9 | 134.8 | 89.1 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| Tuxpeno x | 100 | 37.9 | 25.9 | 52.1 | 5.6 | 4.6 | 0.6 | 136.1 | 92.6 |
| BS13 | 75 | 50.9 | 24.1 | 58.3 | 5.6 | 6.9 | 0.3 | 133.7 | 90.0 |
| | 50 | 69 4 | 22.1 | 58.4 | 6.9 | 7.5 | 0.1 | 132.6 | 88.1 |
| | 25 | 57.6 | 20.6 | 60.2 | 4.8 | 10.6 | 0.4 | 125.3 | 89.0 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Tuxpeno x | 100 | 37.9 | 25.9 | 52.1 | 5.6 | 4.6 | 0.6 | 136.1 | 92.6 |
| BS26 | 75 | 48.0 | 24.7 | 57.7 | 6.3 | 6.2 | 0.4 | 132.9 | 90.9 |
| | 50 | 58.8 | 22.3 | 55.3 | 5.5 | 6.0 | 0.2 | 137.8 | 87.8 |
| | 25 | 59.6 | 21.3 | 60.1 | 4.3 | 9.7 | 0.7 | 130.1 | 87.0 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |

Table 6. (Continued)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BS13 x BS26 (BS13 as exotic) | 100 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| | 75 | 59.0 | 20.1 | 59.2 | 4.6 | 11.4 | 0.4 | 125.1 | 88.2 |
| | 50 | 66.8 | 19.8 | 59.3 | 3.5 | 13.7 | 0.6 | 129.6 | 85.7 |
| | 25 | 50.3 | 20.4 | 60.5 | 2.7 | 13.5 | 0.8 | 124.9 | 85.0 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| Exotic x BS13 | 100 | 40.1 | 22.3 | 55.4 | 5.8 | 9.8 | 0.4 | 121.7 | 86.2 |
| | 75 | 52.6 | 21.8 | 58.4 | 5.4 | 11.0 | 0.4 | 126.2 | 86.0 |
| | 50 | 62.6 | 21.0 | 58.7 | 5.3 | 11.3 | 0.4 | 129.1 | 85.8 |
| | 25 | 57.1 | 19.9 | 59.7 | 4.6 | 11.7 | 0.3 | 125.1 | 87.3 |
| | 0 | 49.4 | 18.9 | 59.0 | 4.9 | 10.3 | 0.3 | 114.5 | 89.1 |
| Exotic x BS26 | 100 | 40.1 | 22.3 | 55.4 | 5.8 | 9.8 | 0.4 | 121.7 | 86.2 |
| | 75 | 50.5 | 21.9 | 58.7 | 5.1 | 11.3 | 0.7 | 125.2 | 85.7 |
| | 50 | 57.9 | 20.9 | 59.1 | 4.0 | 10.5 | 0.7 | 124.5 | 84.7 |
| | 25 | 57.0 | 20.7 | 59.7 | 3.2 | 11.9 | 0.8 | 124.5 | 85.0 |
| | 0 | 57.1 | 20.8 | 59.4 | 2.6 | 14.1 | 0.7 | 120.4 | 85.8 |
| BSSS(R)C11 x BSCB1(R)C11 | | 79.4 | 19.8 | 59.2 | 1.6 | 9.1 | 0.1 | 128.7 | 81.2 |
| B73 x MO17 | | 75.3 | 18.7 | 58.3 | 4.3 | 4.5 | 0.6 | 131.2 | 83.5 |
| BS10(FR)C8 x BS11(FR)C8 | | 74.1 | 20.0 | 56.9 | 2.7 | 11.4 | 0.6 | 130.7 | 80.7 |
| Tuxpeno x BS13 | | 72.0 | 22.7 | 57.6 | 6.0 | 9.8 | 0.0 | 135.3 | 82.6 |
| BS13 x Suwan 1 | | 69.1 | 25.4 | 60.2 | 9.1 | 10.5 | 0.1 | 151.2 | 83.4 |
| Std. dev. | | 8.9 | 1.8 | 3.4 | 4.9 | 5.7 | 1.2 | 7.8 | 1.6 |

BS13 (6.9%), had greater root lodging when compared with both parents. Higher percentage of stalk lodging was observed in the $F_1$ hybrids of Cateto by BS13 (14.6%), Caribbean Flint by BS13 (11.7%), Mexican Dent by BS13 (10.9%), and BS16 by BS13 (11.9%) when compared with both parents. In the cross of Suwan 1 by BS13, the adapted parent BS13 (10.3%) and the $F_1$ hybrid (10.3%) had higher stalk lodging than the 100% exotic germplasm (7.3%). For root lodging using BS26 as adapted germplasm, most of the $F_1$ hybrids were between the exotic and the adapted germplasm. The crosses of Caribbean Flint by BS26 (3.1%) and BS16 by BS26 (4.4%) were exceptions because the $F_1$ hybrids had greater root lodging when compared with both parents. The cross Suwan 1 by BS26 had greater root lodging (4.7%) in comparison with the adapted, 0% exotic germplasm (2.6%), but this value was considerably lower when compared with the 100% exotic germplasm (12.8%). Lower values for percentage of stalk lodging were observed for the crosses Cateto by BS26 (11.7%), Antigua by BS26 (14.0%), and BS16 by BS26 (9.7%) in comparison with the other percentages of exotic germplasm. For the other crosses the $F_1$ hybrids had values that were in between both parents.

The percentage of dropped ears ranged from 0.1 to 1.2%. The average lowest values were obtained in the crosses Cateto by BS13, Caribbean Flint by BS13, Suwan 1 by BS13, and Tuxpeño by BS13. The highest values were observed with Mexican Dent by BS26 and Antigua by BS26.

With the exception of 100% Antigua (136.7cm), 100% Suwan 1 (160.3cm), and 100% Tuxpeño (136.1cm), the crosses of exotic with BS13 showed an increase in ear height for the different levels of exotic germplasm (75%, 50%, and 25%), in comparison with the parents (100% and 0% exotic germplasm). Ear heights for the intermediate levels of exotic germplasm (75%, 50%, and 25%) were usually between the values for the parents (100% and 0% exotic germplasm) for the crosses with BS26. Exceptions were observed in the crosses with Tuxpeño, where the $F_1$ hybrids had a higher ear height (137.8cm), and in the crosses with Cateto (121.1cm) and BS16 (122.8cm), where the materials with 25% exotic germplasm had higher ear height.

The pattern for days-to-anthesis for most of the crosses between exotic and adapted germplasm showed that this trait increased with decreasing percentages of exotic germplasm, suggesting that some of the exotic materials were well adapted to the U.S. Corn Belt. The crosses of Suwan 1 by BS13 and Suwan 1 by BS26, had larger values for days-to-anthesis (92.6 days for both crosses) in comparison with the adapted germplasm, which were 89.1 days for BS13 and 85.8 days for BS26. The cross of Tuxpeño by BS13 was one day earlier than the adapted material, while for the cross of Tuxpeño by BS26 was two days later than the adapted parent. Days-to-anthesis were similar among the different percentages of exotic germplasm in the cross of Antigua by BS26. For the other crosses, the days-to-anthesis for the $F_1$ hybrids were less than both adapted parents.

The best three treatments, evaluated for yield per se, do not include exotic germplasm, but the crosses of Suwan 1 by BS13 (67.4 q/ha), Suwan 1 by BS26 (63.5 q/ha), and Tuxpeño by BS13 (69.4 q/ha) have great potential for future development. Both Suwan 1 and Tuxpeño used in this study had two cycles of selection for adaptation in the U.S. Corn Belt when compared with the other exotic germplasms. Without averaging the yields in the reciprocal crosses, the crosses of Tuxpeño by BS13 per se and BS13 by Suwan 1 per se had yields of 72.0 q/ha and 69.1 q/ha, respectively. With the exception of the $F_1$ hybrid of the cross BS16 by BS26, which yielded 59.7 q/ha, the crosses among exotic germplasm by BS13 showed greater values than the crosses among exotic germplasm by BS26. On average, BS13 crosses were superior to BS26 crosses by approximately 5.0 q/ha.

An increase in yield has been reported in crosses of exotic by adapted germplasm when compared with their individual parents (Moll et al., 1962: Moll et al., 1965; Wellhausen, 1965). However, some authors indicated that no immediate positive effects are observed when crossing exotic by adapted germplasm (Chopra, 1964; Kramer and Ullstrup, 1959; Efron and Everett, 1969). Studies reported by different researchers suggest that between 25 and 50% of exotic germplasm introgressed into adapted population would permit optimum long-term results in recurrent selection programs (Lonnquist, 1974; Dudley, 1984; Geadelman, 1984; Sallah, 1984; Crossa and Gardner, 1987).

Troyer and Brown (1972) reported plant height was maturity associated because after tassel initiation no more nodes were formed. Ear height was closely associated with plant height. In some of the crosses in their study, the pattern of higher ear height, later maturity, and higher moisture content was observed.

Hallauer and Malithano (1975) included three semiexotic varieties (BS2, BSTL, and Teozea) in two diallel series of crosses with Corn Belt adapted varieties. They reported that the yields of the semiexotic varieties were equal to most of the adapted varieties. Oyervides-Garcia et al. (1985) and Mungoma and Pollak (1988) observed that populations derived from 'Iowa Stiff Stalk Synthetic' combined better with exotic germplasm than did Lancaster derived populations.

Gutierrez-Gaitan et al. (1986) evaluated 24 Mexican populations crossed with U.S. Corn Belt populations, BS13(S)C3 and Lancaster Composite. They observed that grain moisture at harvest, ear height, and days-to-flower were greater in crosses compared with testers per se. BS13(S)C3 testcrosses had significantly greater yields than Lancaster testcrosses. They also observed that testcrosses tended to have higher root lodging and lower stalk lodging than the testers per se, and the check hybrids tended to be lower for root and stalk lodging.

Crossa and Gardner (1987) reported that adapted and backcross (25% exotic germplasm) populations did not differ in grain yield or days-to-anthesis. They also observed that the adapted and the backcross exceeded the cross population (50% exotic germplasm) in grain yield and were earlier maturing. Bridges and Gardner (1987) found instances where the cross population was superior to the backcross for long-term selection, particularly when the superiority of the adapted population over the exotic population was due to the presence of favorable alleles at loci with large effects.

Heterosis can be expressed when the parents of a hybrid have different alleles at a locus and there is some level of dominance among those alleles (Falconer, 1981). The performance of a hybrid relative to its parents can be evaluated in two ways: midparent heterosis, which is the performance of a hybrid compared with the average performance of its parents and high parent heterosis, which is a comparison of the performance of the hybrid with that of the best parent in the cross. Higher values for midparent heterosis show that the gene frequencies have become more complementary in their genetic structures in the $F_1$ hybrids in comparison with the parents. A lower value for midparent heterosis indicates that the gene frequencies are similar in both parents.

The mean yield (q/ha), midparent heterosis (%), and high parent heterosis (%) among crosses of adapted by exotic germplasm are presented in Table 7. With the exception of the crosses of Cateto by BS26 (51.5 q/ha), Caribbean Flint by BS26 (56.1 q/ha) compared with BS26 per se which yielded 57.1 q/ha, and the cross of Tuxpeño by BS26 in which the highest value was observed for the treatment with 25% exotic germplasm (59.6 q/ha), all the other $F_1$ hybrids for both sources of adapted germplasm crossed with exotic germplasm showed higher yields when compared with both parents. The best yields for crosses with BS13 adapted germplasm were Tuxpeño (69.4 q/ha), Suwan 1 (67.4 q/ha), and Mexican Dent (64.6 q/ha). Higher midparent heterosis value was observed in crosses of BS13 with Suwan 1 (89.6%), Tuxpeño (59.0%), and Caribbean Flint (41.5%). When evaluating high parent heterosis for BS13 crosses, the exotic germplasm that showed the highest value was Tuxpeño (40.5%), followed by Suwan 1 (36.4%), and Caribbean Flint (25.3%). Although the high parent heterosis values were lower than the midparent heterosis, they show that the yields for the crosses were greater than the best parents.

The highest yields of BS26 were obtained in the crosses with Suwan (63.5 q/ha), BS16 (59.7 q/ha), Tuxpeño (58.8% q/ha), and Antigua

Table 7. Mean yields, midparent heterosis, and high parent heterosis for crosses of adapted x exotic germplasm evaluated in seven environments

| | BS13 | | | BS26 | | |
|---|---|---|---|---|---|---|
| | Yield (q/ha) | Midparent heterosis (%) | High parent heterosis (%) | Yield (q/ha) | Midparent heterosis (%) | High parent heterosis (%) |
| Cateto | 55.7 | 31.8 | 12.8 | 51.5 | 11.7 | - 9.8 |
| Carib. Flint | 61.9 | 41.5 | 25.3 | 56.1 | 17.9 | - 1.8 |
| Mexican Dent | 64.7 | 25.8 | 21.0 | 57.3 | 3.6 | 0.3 |
| Antigua | 61.0 | 22.4 | 21.3 | 58.2 | 8.4 | 1.9 |
| BS16 | 58.1 | 23.9 | 17.6 | 59.7 | 17.6 | 4.6 |
| Suwan 1 | 67.4 | 89.6 | 36.4 | 63.5 | 61.2 | 11.2 |
| Tuxpeño | 69.4 | 59.0 | 40.5 | 58.8 | 23.8 | 3.0 |
| Mean exotics | 62.6 | 39.9 | 26.7 | 57.9 | 19.1 | 1.4 |
| BS13 | ---- | ---- | ---- | 66.8 | 25.4 | 17.0 |

(58.2 q/ha). The pattern for the high parent heterosis followed the same sequence: Suwan 1 (11.2%), BS16 (4.6%), Tuxpeño (3.0%), and Antigua (1.9%). The estimate of midparent heterosis presented the greatest value for Suwan 1 (61.2%), followed by Tuxpeño (23.8%), Caribbean Flint (17.9%), and BS16 (17.6%). The negative values obtained for the high parent heterosis in the crosses with Cateto and Caribbean Flint reflect the lower yield for both $F_1$ crosses in relation to the best parent, in this case BS26 (57.1 q/ha). The yield of Mexican Dent by BS26 (57.3 q/ha), was similar to the best parent, BS26 (57.1 q/ha).

Estimates of midparent heterosis for grain moisture, stand, root and stalk lodging, dropped ears, ear height, and days-to-anthesis for crosses among adapted by exotic germplasm, are presented in Table 8. Negative values for grain moisture were observed for both BS13 and BS26 when crossed to Suwan 1 and Tuxpeño. Although the grain moisture content for the $F_1$ hybrids decreased in these crosses, they did not decrease to the values of the adapted germplasm (Table 6). Antigua by BS26 and BS16 by BS26 also showed negative values for the midparent heterosis. The percentage of root lodging increased in Caribbean Flint by BS26, Mexican Dent by BS13, and in the crosses of the exotic germplasm BS16 and Tuxpeño with both adapted germplasms, BS13 and BS26. The negative values indicate a decrease in the percentage of root lodging in relation to either one or both parents involved in the crosses. For stalk lodging, the crosses of BS13 by exotic germplasm showed an increase for almost all the crosses in relation to both parents, except with Antigua, which showed a decrease in relation to the exotic but not to the adapted germplasm (Table 6). Suwan 1 by BS13 and Tuxpeño by BS13 had higher percentages of stalk lodging in relation to the exotic germplasm (Table 6). Nearly all of the crosses of exotic germplasm with BS26 showed a decrease in stalk lodging in relation to the midparent. Caribbean Flint by BS26 did not show any change for this trait (0.0%). Negative and positive values for midparent heterosis were observed for dropped ears in the crosses of exotic germplasm with both adapted germplasm. The highest values were observed for Cateto by BS13, Antigua by BS13, and Antigua by BS26. The positive values for ear height among crosses of exotic germplasm by BS13 showed that the $F_1$ crosses had higher

Table 8. Midparent heterosis (%) for seven traits calculated for crosses of adapted x exotic germplasm

| | Moisture | | Stand | | Lodging | | | | Dropped ears | | Ear height | | Days-to-anthesis | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Root | | Stalk | | | | | | | |
| | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 |
| Cateto | 6.2 | 0.2 | 1.0 | 4.6 | -28.7 | - 5.1 | 22.7 | -15.2 | 150.0 | 75.0 | 15.0 | -1.4 | -1.2 | -1.6 |
| Car. Flint | 3.6 | 0.2 | 8.0 | 7.6 | -21.2 | 44.2 | 34.5 | - 0.0 | 14.3 | - 9.1 | 15.8 | 3.1 | -2.5 | -2.3 |
| Mex. Dent | 1.1 | 0.8 | 2.4 | 2.6 | 11.1 | -24.7 | 13.0 | - 6.5 | - 25.0 | 33.3 | 7.0 | -1.5 | -2.0 | -2.0 |
| Antigua | 6.1 | -2.0 | -1.9 | 2.3 | - 2.6 | -30.4 | - 6.9 | - 6.0 | 100.0 | 100.0 | 6.0 | -0.7 | -0.4 | -1.3 |
| BS16 | 0.6 | -6.3 | 1.1 | 1.3 | 13.6 | 51.7 | 9.2 | -24.2 | - 11.1 | 7.7 | 6.1 | 5.4 | -2.6 | -0.3 |
| Suwan 1 | -2.7 | -7.7 | 3.1 | 3.6 | - 7.3 | -39.0 | 17.0 | - 1.9 | 60.0 | -11.1 | 10.6 | 6.4 | -3.1 | -1.4 |
| Tuxpeno | -1.3 | -4.5 | 5.1 | -0.8 | 31.4 | 34.1 | 0.7 | -35.8 | - 77.8 | -69.2 | 5.8 | 7.4 | -3.0 | -1.6 |
| Mean exotic | 1.9 | -3.0 | 2.6 | 3.0 | - 1.0 | -4.8 | 12.4 | -12.1 | 14.3 | 27.3 | 9.3 | 2.9 | -2.1 | -1.5 |
| BS13 | --- | -0.3 | --- | 0.2 | ---- | - 6.7 | ---- | 12.3 | ---- | 20.0 | --- | 10.3 | ---- | -2.0 |

ear placement than the midparent. For BS26, although positive and negative midparent heterosis were observed, only the cross of Tuxpeño by BS26 had a higher ear placement than both parents. For the other crosses the value for ear height was always between the two parents.

BS13 and BS26 showed negative midparent heterosis for days-to-anthesis for all the crosses with the exotic germplasms. With the exceptions of Caribbean Flint by BS26, Antigua by BS26, and Tuxpeño by BS13, which showed a reduction for days-to-anthesis in the crosses in relation to both parents, the other crosses showed a reduction in days-to-anthesis only for one of the parents. Suwan 1 had the greatest reduction for days-to-anthesis in crosses with BS13 and with BS26. In both instances, the reduction was about 10 days.

Coefficient of determination ($R^2$), which is the proportion of total variation accounted for by a regression analysis using the percentage of exotic germplasm as the independent variable and the traits evaluated as the dependent variable, are given in Table 9. The highest values ($\geq 0.45$) were observed for yield, ear height, and days-to-anthesis, when using Suwan 1 as the exotic germplasm in the crosses with both adapted germplasms. For yield, $R^2$ values were higher for BS13 than for BS26. Both adapted germplasms had the same $R^2$ value when crossed with BS16, and nearly equal $R^2$ values when crossed with Cateto, Suwan 1, and Tuxpeño. For the other traits evaluated, the $R^2$ values were low. The different environments used as well as the differences among the exotic and the adapted germplasms could be contributing factors for the lower $R^2$ values.

Table 9. Coefficient of determination ($R^2$) from a regression analysis between adapted x exotic germplasm crosses evaluated for eight traits

| | Yield | | Moisture | | Stand | | Lodging: Root | | Lodging: Stalk | | Dropped ears | | Ear height | | Days-to-anthesis | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 | BS13 | BS26 |
| Cateto | 0.39 | 0.36 | 0.02 | 0.01 | 0.05 | 0.08 | 0.00 | 0.03 | 0.05 | 0.01 | 0.03 | 0.02 | 0.18 | 0.10 | 0.24 | 0.11 |
| Car. Flint | 0.31 | 0.22 | 0.02 | 0.00 | 0.21 | 0.21 | 0.03 | 0.01 | 0.10 | 0.03 | 0.01 | 0.01 | 0.29 | 0.14 | 0.26 | 0.06 |
| Mex. Dent | 0.13 | 0.01 | 0.00 | 0.05 | 0.11 | 0.03 | 0.00 | 0.02 | 0.03 | 0.05 | 0.00 | 0.01 | 0.06 | 0.05 | 0.24 | 0.06 |
| Antigua | 0.12 | 0.02 | 0.03 | 0.00 | 0.00 | 0.01 | 0.01 | 0.07 | 0.04 | 0.00 | 0.05 | 0.02 | 0.19 | 0.11 | 0.06 | 0.01 |
| BS16 | 0.14 | 0.14 | 0.00 | 0.03 | 0.01 | 0.08 | 0.00 | 0.01 | 0.00 | 0.03 | 0.04 | 0.04 | 0.09 | 0.16 | 0.23 | 0.09 |
| Suwan 1 | 0.53 | 0.51 | 0.34 | 0.31 | 0.12 | 0.14 | 0.03 | 0.12 | 0.04 | 0.05 | 0.03 | 0.04 | 0.54 | 0.48 | 0.44 | 0.48 |
| Tuxpeno | 0.36 | 0.35 | 0.20 | 0.12 | 0.20 | 0.15 | 0.00 | 0.02 | 0.20 | 0.30 | 0.01 | 0.03 | 0.14 | 0.08 | 0.07 | 0.15 |
| Mean exotics | 0.23 | 0.19 | 0.04 | 0.01 | 0.08 | 0.08 | 0.00 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 |
| BS13 | ---- | 0.11 | ---- | 0.02 | ---- | 0.02 | ---- | 0.03 | ---- | 0.03 | ---- | 0.04 | ---- | 0.09 | ---- | 0.10 |

Table 10 includes the percentage of variation explained by linear and quadratic regressions using yield as dependent variable and percentage of exotic germplasm as independent variable for crosses among exotic by adapted germplasm. Highly significant differences were observed for the quadratic regression for all the exotic germplasms crossed to BS13 (data not included). With the exception of Cateto by BS13, where the linear regression accounted for more of the variation (59.0%), the other exotic germplasms when crossed with BS13 showed that the quadratic regression accounted for most of the variation among the different percentages of exotic germplasm. A different pattern was observed when using BS26 as adapted germplasm. Although the analysis of variance (data not included) showed highly significant difference for the quadratic regression, most of the variation was accounted for by the linear regression. Exceptions were for Antigua, which was significant only for linear regression, and for Mexican Dent, which was not significant for either linear or quadratic.

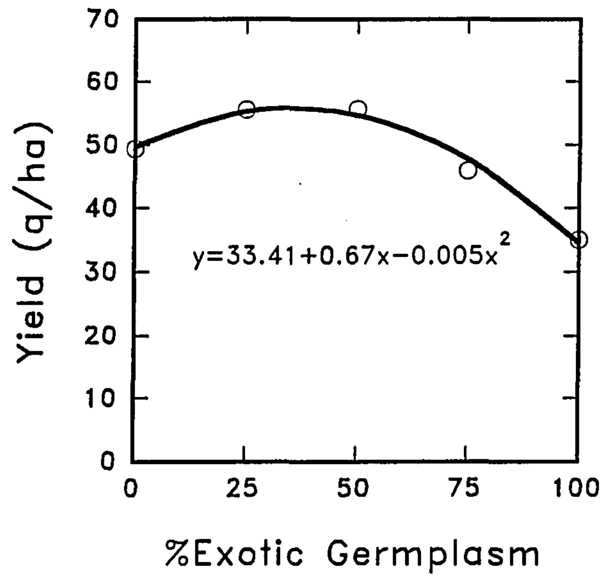
The quadratic regression for comparing the mean of all exotic germplasm with each of the adapted germplasm was highly significant (data not included). More of the variation was accounted for by the quadratic regression (49.0%) for BS13, But the linear regression was more important (77.0%) for BS26.

Graphic representations of the regression analyses are presented in Figures 1 through 8. With the exception of the cross of Antigua by BS26 (Fig. 4-A), all the other crosses showed a quadratic response with the maximum value for yield varying among 0%, 25%, and 50% of exotic germplasm.

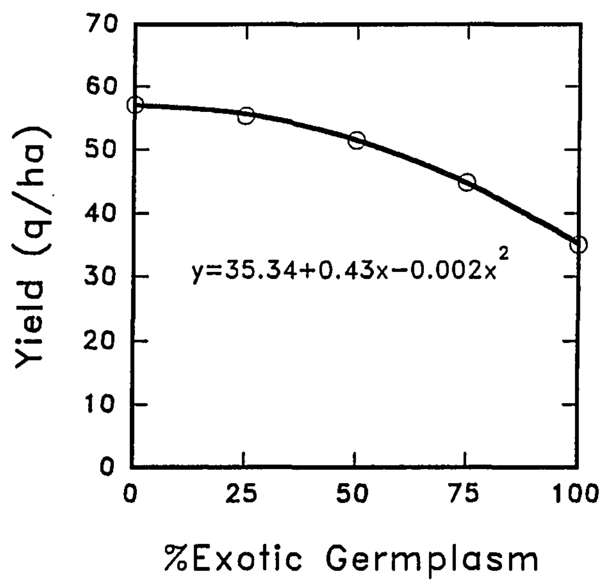
Table 10. Percentage of variation explained by linear and quadratic regression using yield as dependent variable and percentage of exotic germplasm as independent variable for crosses among adapted by exotic germplasm

| Exotic germplasm | BS13 Linear | BS13 Quadratic | BS26 Linear | BS26 Quadratic |
|---|---|---|---|---|
| Cateto | 59.0 | 38.0 | 93.0 | 6.7 |
| Caribbean Flint | 15.4 | 75.4 | 69.6 | 23.2 |
| Mexican Dent | 3.0 | 58.6 | ---- | ---- |
| Antigua | 11.7 | 80.0 | 36.0 | 11.8 |
| BS16 | 9.4 | 89.4 | 54.9 | 39.0 |
| Suwan 1 | 37.7 | 58.6 | 55.3 | 40.8 |
| Tuxpeño | 18.6 | 60.4 | 77.4 | 20.2 |
| Mean exotics | 45.0 | 49.0 | 77.0 | 21.0 |
| BS13 | ---- | ---- | 4.6 | 62.2 |

Although few crosses did not show significance for the regression analyses, the results for yield agree with those of Iglesias (1989): populations with 50% exotic germplasm seem to provide a more useful approach to combining desirable alleles from an exotic source with a favorable genetic complement of an adapted maize germplasm.

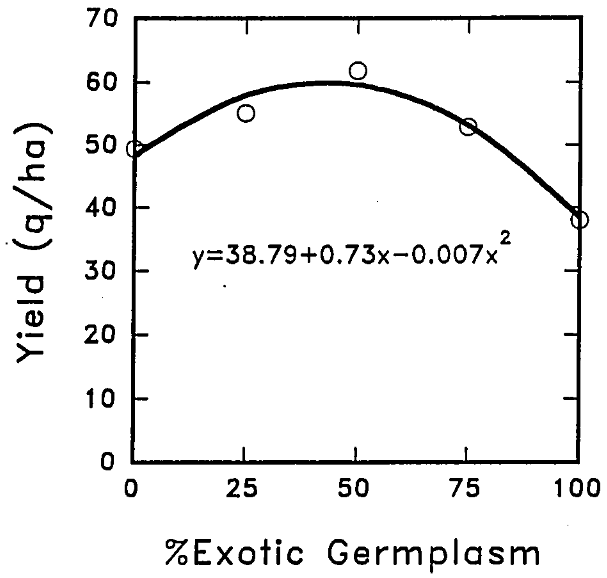



(A)

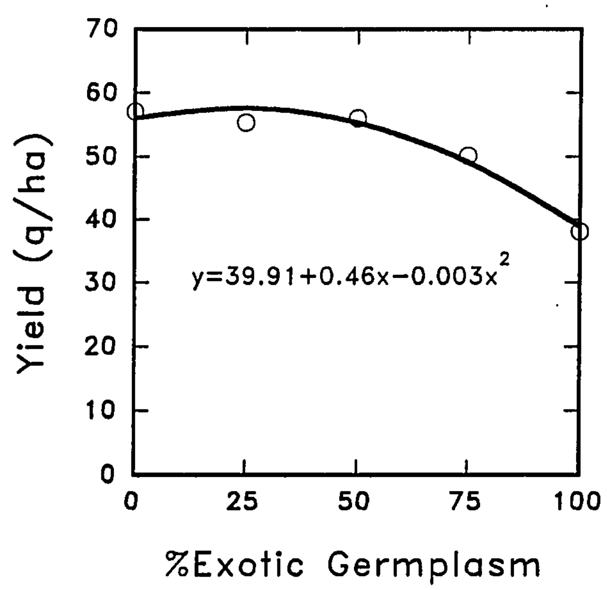



(B)

Figure 1. Response to regression of yield to percentage of exotic germplasm in the cross of Cateto x BS13 (A) and in the cross of Cateto x BS26 (B)

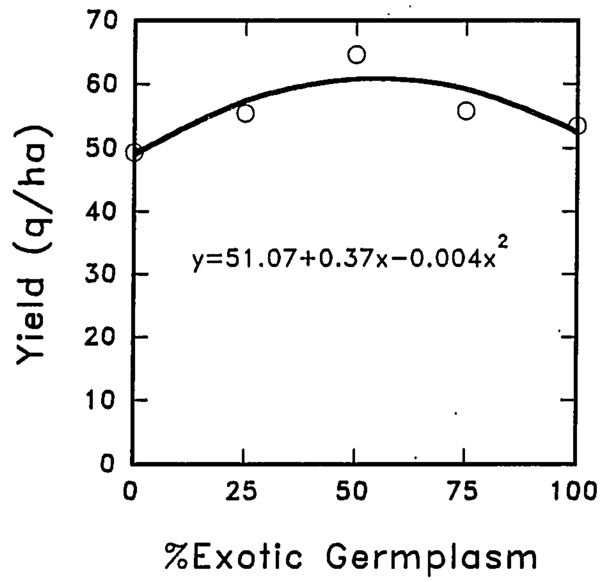



(A)

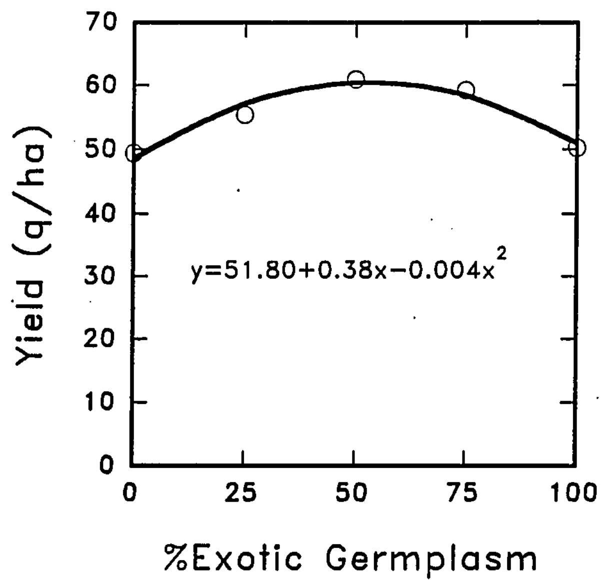



(B)

Figure 2. Response to regression of yield to percentage of exotic germplasm in the cross of Caribbean Flint x BS13 (A) and in the cross of Caribbean Flint x BS26 (B)

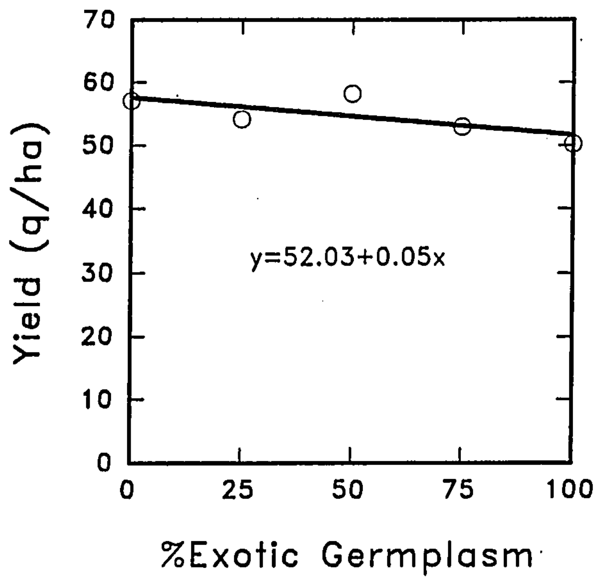



(A)

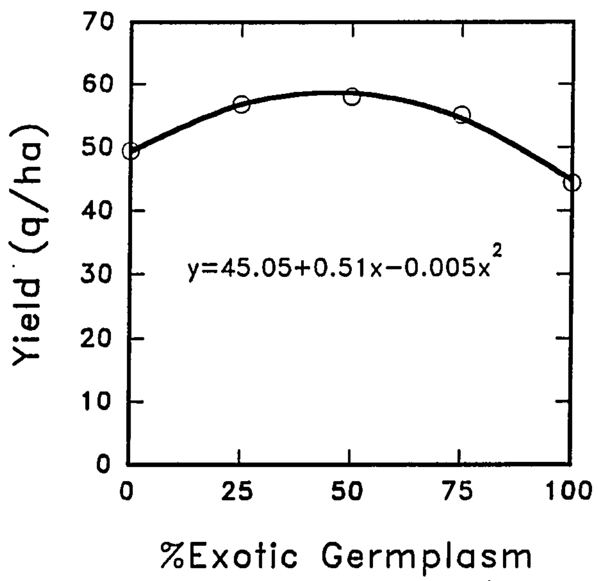



(B)

Figure 3. Response to regression of yield to percentage of exotic germplasm in the cross of Mexican Dent x BS13 (A) and in the cross of Antigua x BS13 (B)

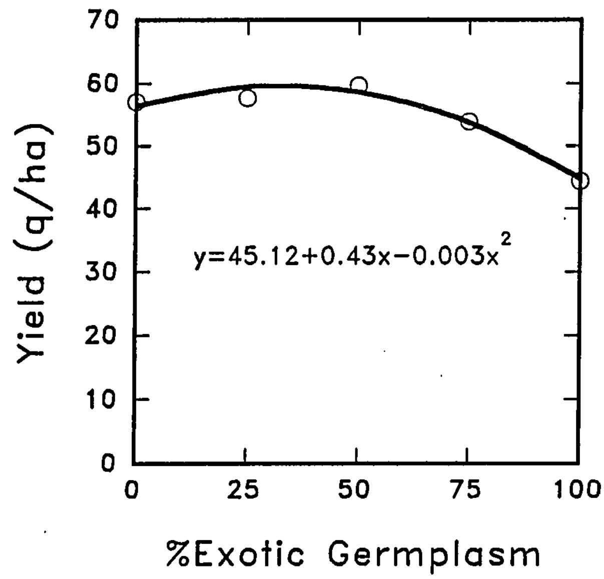



(A)

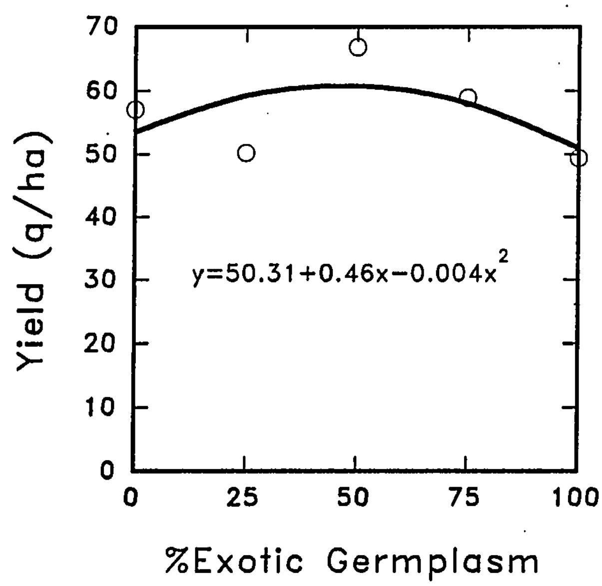



(B)

Figure 4. Response to regression of yield to percentage of exotic germplasm in the cross of Antigua x BS26 (A) and in the cross of BS16 x BS13 (B)

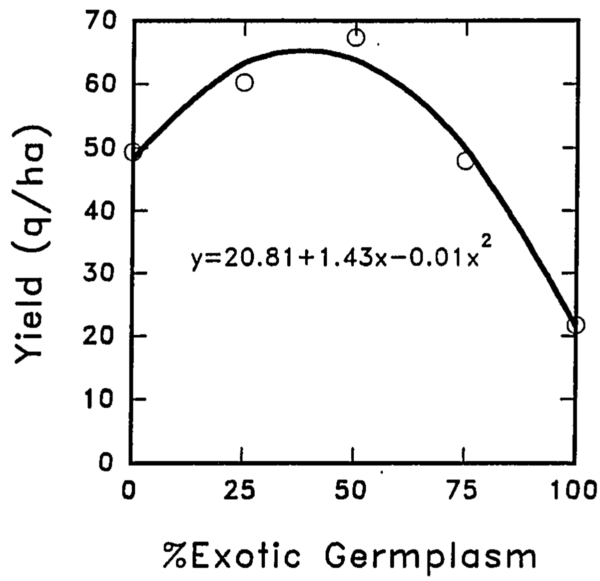



(A)

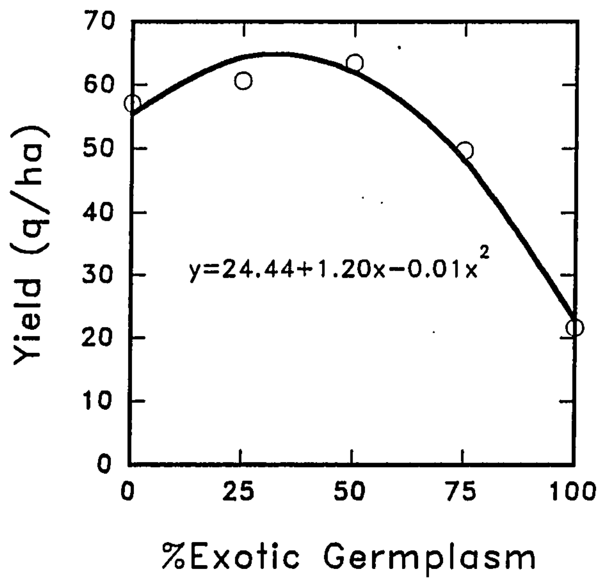



(B)

Figure 5. Response to regression of yield to percentage of exotic germplasm in the cross of BS16 x BS26 (A) and in the cross of BS13 x BS26 using BS13 as exotic germplasm (B)

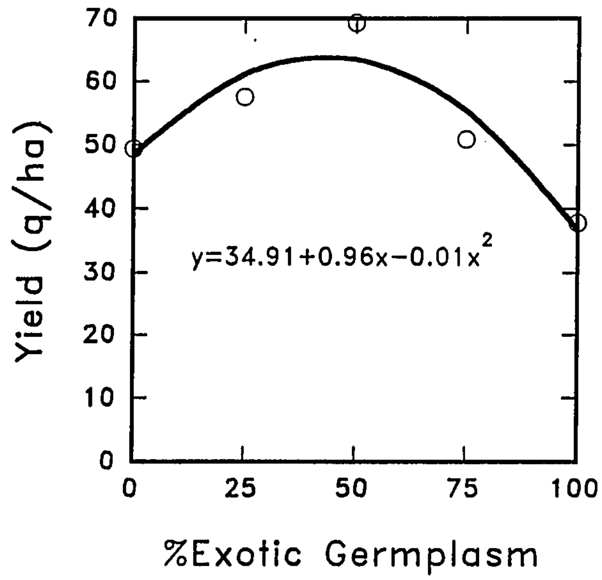



(A)

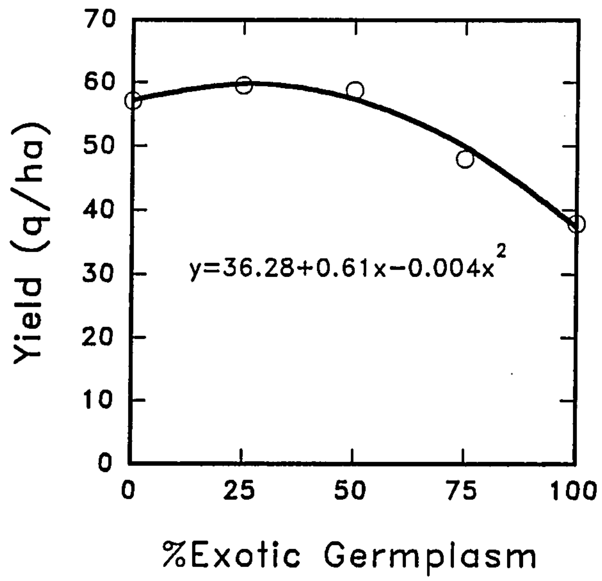



(B)

Figure 6. Response to regression of yield to percentage of exotic germplasm in the cross of Suwan 1 x BS13 (A) and in the cross of Suwan 1 x BS26 (B)

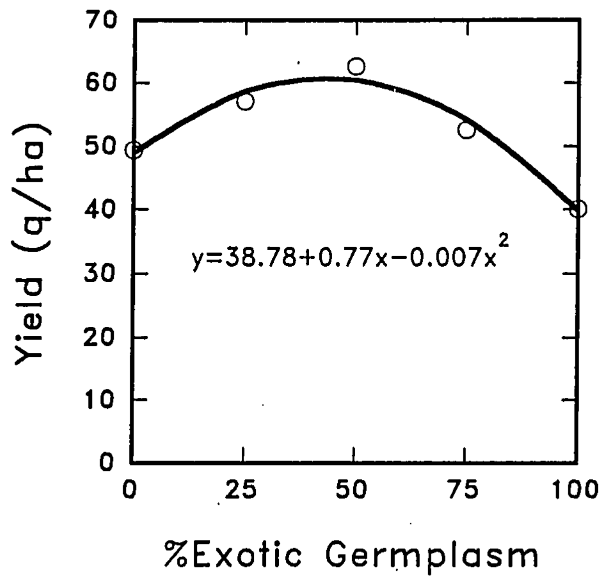



(A)

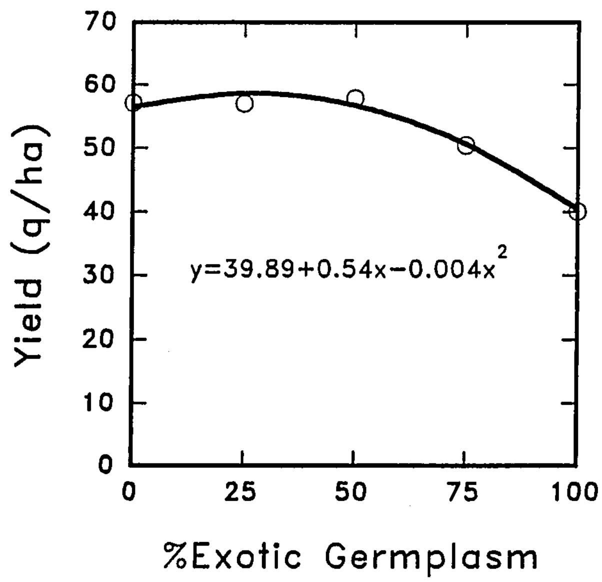



(B)

Figure 7. Response to regression of yield to percentage of exotic germplasm in the cross of Tuxpeño x BS13 (A) and in the cross of Tuxpeño x BS26 (B)




(A)




(B)

Figure 8. Response to regression of yield to percentage of exotic germplasm in the mean crosses of Exotic germplasm x BS13 (A) and in the mean crosses of Exotic germplasm x BS26 (B)

## CONCLUSIONS

Two adapted (BS13 and BS26) and seven exotic germplasm (Cateto, Caribbean Flint, Mexican Dent, Antigua, BS16, Suwan 1, and Tuxpeño) sources were evaluated per se and in crosses between adapted and exotic sources. Five levels of proportions of exotic (0, 25, 50, 75, and 100%) and adapted germplasm sources were evaluated at seven Iowa environments. Data were collected for eight traits to determine the relative contributions of the adapted and exotic germplasm sources for the different levels of exotic germplasm.

Highly significant differences ($P \leq 0.01$) for grain yield, grain moisture, root and stalk lodging, and days-to-anthesis were detected among treatments and treatment by environment interactions. Dropped ears and ear height were highly significant only for treatments. With the exceptions of Cateto by BS26, Caribbean Flint by BS26, and Tuxpeño by BS26, the data obtained for yield suggested that 50% exotic germplasm introgressed into adapted germplasm (crosses among exotic by adapted germplasm) was the best combination. For the other traits evaluated, different patterns of exotic and adapted germplasm were observed.

Suwan 1 and Tuxpeño when crossed with BS13 and Suwan 1 when crossed with BS26 had the highest yields, midparent heterosis, and coefficients of determination for the regression analyses among the exotic germplasm tested. With the exception of the Cateto by BS13, all the other crosses when using BS13 as adapted germplasm showed that most of the variation was accounted for by the quadratic regression, whereas using BS26, most of the variation was accounted for by the linear regression.

Maize breeders consider heterotic patterns in their breeding programs. The establishment of heterotic patterns was made empirically by relating the heterosis observed in crosses. Evolutionary considerations were not used to develop heterotic patterns per se, but heterotic patterns do occur because of selection, both artificial and natural, that has occurred in the improvement of the open-pollinated cultivars (Hallauer et al., 1988).

The results for Suwan 1 and Tuxpeño, in crosses with BS13 and Suwan 1 in cross with BS26 suggest the heterotic pattern of Suwan 1 by Tuxpeño for exotic sources. This suggestion supports the origin of Suwan 1 because Suwan 1 is primarily Cuban Flint and in the tropical areas where maize is grown, the heterotic pattern Cuban Flint by Tuxpeño has been exploited (Goodman, 1985).

Two reciprocal recurrent selection programs can be used to develop lines from the heterotic patterns Suwan 1 by Tuxpeño and BS13 by BS26 to exploit the heterosis expressed in hybrids of their crosses: lines developed from Suwan 1 would be tested with lines developed from Tuxpeño and BS26; lines developed from Tuxpeño would be tested with lines developed from Suwan 1 and BS13; lines developed from BS13 would be tested with lines developed from BS26 and Tuxpeño; and lines developed from BS26 would be tested with lines developed from BS13 and Suwan 1. Breeders could take advantage, therefore, of the heterosis expressed in two widely used heterotic groups.

The concern of the narrow genetic variability for the U.S. maize populations exists and one way to reduce this concern is to use exotic germplasms. Among the exotic germplasms tested, Suwan 1 and Tuxpeño have the greater potential to be used in the U.S. maize breeding programs. Time, money, patience, and people involved in research will be necessary to demonstrate that exotic germplasm has its place in the U.S. maize breeding programs to broaden the genetic variability that exists in the U.S. maize populations that are being used today.

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# GENERAL SUMMARY

Several authors have discussed and suggested the use of exotic germplasm to increase genetic variability of U.S. maize germplasm. The objectives of this study were (1) to determine the relative performance of seven exotic populations (Cateto, Caribbean Flint, Mexican Dent, Antigua, BS16, Suwan 1, and Tuxpeño) to two widely used U.S. Corn Belt populations [BS13(S)C4 and BS26], (2) to determine the proportions of the exotic to adapted germplasm that exhibited superior performance, and (3) to determine the heterotic patterns between the exotic populations and the two widely used Corn Belt populations. The 169 treatments were evaluated in a 13 x 13 simple lattice design, and the study was conducted at seven Iowa environments. The treatments included two adapted (0% exotic) and seven exotic populations (100% exotic), the crosses (50% exotic) and backcrosses (75% or 25% exotic germplasm) between the populations, and the check varieties.

Highly significant differences ($P \leq 0.01$) among treatments and treatment by environment interactions were observed for grain yield, grain moisture, root and stalk lodging, and days-to-anthesis. Dropped ears and ear height were highly significant only for treatments. With the exceptions of the crosses Cateto by BS26, Caribbean Flint by BS26, and Tuxpeño by BS26 the data obtained for yield suggested that 50% exotic germplasm introgressed into adapted germplasm was the best combination of adapted and exotic germplasm. Among the seven exotic populations tested, Suwan 1 and Tuxpeño exhibited greater potential for continuing development.

Suwan 1 and Tuxpeño had only two years of selection for adaptation in the U.S. Corn Belt compared with six cycles of selection for the other exotic populations. The crosses Suwan 1 by BS13, Tuxpeño by BS13, and Suwan 1 by BS26 had higher yields compared with crosses to other exotic populations. Overall, BS13(S)C4 combined better with the exotic populations than did BS26. Use of the heterotic pattern of Suwan 1 by Tuxpeño is suggested as exotic sources that are considered promising for increasing the genetic variability of the U.S. Corn Belt breeding programs.

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# APPENDIX. TREATMENT MEANS FOR EACH ENVIRONMENT

AMES AGRONOMY AND AGRICULTURAL ENGINEERING RESEARCH CENTER 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 64.5 | 21.1 | 49.2 | 19.0 | 14.3 | 0.0 | 130.8 | 82.2 |
| (CATxBS13) x BS13 | 2 | 58.0 | 20.3 | 55.5 | 22.0 | 5.5 | 0.0 | 131.8 | 86.2 |
| BS13 x (CATxBS13) | 3 | 54.0 | 19.8 | 64.1 | 12.9 | 7.5 | 0.0 | 137.9 | 84.2 |
| (CATxBS13) x CATETO | 4 | 46.7 | 20.0 | 60.2 | 21.5 | 7.3 | 0.0 | 128.2 | 80.4 |
| CATETO x (CATxBS13) | 5 | 48.8 | 20.4 | 61.0 | 28.8 | 7.4 | 0.0 | 123.9 | 78.7 |
| BS13(S)C4 x CATETO | 6 | 55.7 | 20.6 | 56.1 | 7.2 | 8.0 | 0.0 | 145.9 | 81.3 |
| (BS13xCAT) x BS13 | 7 | 56.1 | 20.5 | 55.7 | 21.9 | 7.8 | 0.0 | 131.3 | 83.4 |
| BS13 x (BS13xCAT) | 8 | 53.1 | 21.1 | 57.6 | 18.7 | 11.6 | 0.0 | 143.7 | 85.4 |
| (BS13xCAT) x CATETO | 9 | 43.4 | 21.3 | 55.6 | 22.3 | 7.5 | 0.0 | 140.4 | 81.0 |
| CATETO x (BS13xCAT) | 10 | 46.6 | 20.9 | 57.0 | 8.2 | 13.6 | 0.0 | 138.1 | 83.3 |
| CATETO x BS26 | 11 | 52.2 | 23.6 | 53.2 | 5.2 | 14.4 | 0.0 | 131.3 | 81.4 |
| (CATxBS26) x BS26 | 12 | 47.5 | 20.9 | 56.2 | 2.6 | 22.5 | 0.0 | 133.1 | 82.4 |
| BS26 x (CATxBS26) | 13 | 58.6 | 22.0 | 54.9 | 5.3 | 11.9 | 0.0 | 128.0 | 82.8 |
| (CATxBS26) x CATETO | 14 | 47.1 | 21.4 | 55.5 | 19.0 | 7.5 | 0.0 | 136.1 | 79.5 |
| CATETO x(CATxBS26) | 15 | 37.8 | 20.6 | 58.0 | 9.5 | 15.3 | 0.0 | 125.6 | 78.2 |
| BS26 x CATETO | 16 | 65.3 | 20.8 | 58.5 | 7.7 | 10.1 | 0.0 | 119.0 | 79.0 |
| (BS26xCAT) x BS26 | 17 | 50.9 | 21.1 | 56.3 | 4.9 | 13.4 | 0.0 | 133.4 | 82.9 |
| BS26 x (BS26xCAT) | 18 | 81.1 | 20.2 | 56.4 | 8.8 | 7.9 | 0.0 | 126.4 | 81.1 |
| (BS26xCAT) x CATETO | 19 | 46.2 | 21.0 | 59.2 | 8.3 | 7.5 | 0.0 | 125.9 | 78.0 |
| CATETO x (BS26xCAT) | 20 | 51.7 | 21.0 | 56.1 | 9.9 | 11.0 | 0.0 | 126.3 | 77.8 |
| CARIB.FL.x BS13(S)C4 | 21 | 57.3 | 20.6 | 56.9 | 9.8 | 9.3 | 0.0 | 141.8 | 84.7 |
| (CARIBxBS13) x BS13 | 22 | 57.0 | 20.8 | 56.0 | 3.8 | 12.6 | 0.0 | 138.9 | 86.0 |
| BS13 x (CARIBxBS13) | 23 | 59.1 | 21.3 | 55.1 | 6.1 | 9.6 | 0.0 | 140.2 | 87.7 |
| (CARIBxBS13) x CARIB | 24 | 43.2 | 21.4 | 54.5 | 8.1 | 12.1 | 0.0 | 125.0 | 80.7 |
| CARIB x (CARIBxBS13) | 25 | 50.4 | 21.8 | 53.3 | 6.4 | 8.2 | 0.0 | 122.0 | 80.3 |
| BS13(S)C4 x CARIB.FLINT | 26 | 64.6 | 20.0 | 61.2 | 10.1 | 8.0 | 0.0 | 131.5 | 84.2 |
| (BS13xCARIB) x BS13 | 27 | 60.0 | 20.6 | 61.2 | 5.3 | 6.0 | 0.0 | 128.1 | 84.1 |
| BS13 x (BS13xCARIB) | 28 | 61.6 | 21.6 | 61.6 | 6.3 | 7.6 | 0.0 | 129.6 | 87.7 |
| (BS13xCARIB) x CARIB | 29 | 46.9 | 20.5 | 47.8 | 0.1 | 11.3 | 0.0 | 128.5 | 83.1 |
| CARIB x (BS13xCARIB) | 30 | 50.5 | 20.5 | 54.6 | 3.2 | 16.9 | 0.0 | 128.0 | 82.4 |
| CARIB.FLINT x BS26 | 31 | 63.1 | 20.1 | 56.0 | 5.5 | 5.4 | 0.0 | 126.7 | 80.1 |
| (CARIBxBS26) x BS26 | 32 | 51.3 | 20.0 | 53.2 | 10.2 | 5.0 | 0.0 | 115.7 | 81.3 |
| BS26 x (CARIBxBS26) | 33 | 58.8 | 20.3 | 60.3 | 3.0 | 6.6 | 0.0 | 136.9 | 82.6 |
| (CARIBxBS26) x CARIB | 34 | 47.9 | 22.1 | 57.4 | 7.6 | 5.5 | 0.0 | 124.3 | 81.1 |
| CARIB x (CARIBxBS26) | 35 | 53.9 | 19.6 | 50.9 | 9.0 | 12.0 | 0.0 | 124.1 | 81.1 |
| BS26 x CARIB.FLINT | 36 | 50.3 | 21.3 | 56.5 | 6.2 | 10.8 | 0.0 | 128.3 | 81.6 |
| (BS26xCARIB) x BS26 | 37 | 53.6 | 21.0 | 52.0 | 16.5 | 7.8 | 0.0 | 129.6 | 83.3 |
| BS26 x (BS26xCARIB) | 38 | 61.6 | 19.3 | 57.6 | 6.3 | 6.7 | 0.0 | 133.0 | 83.7 |
| (BS26xCARIB) x CARIB | 39 | 54.0 | 20.8 | 56.1 | 3.6 | 11.1 | 0.0 | 126.4 | 82.8 |
| CARIB x (BS26xCARIB) | 40 | 41.9 | 19.8 | 47.9 | 6.8 | 20.6 | 0.0 | 123.2 | 81.3 |
| MEX. DENT x BS13(S)C4 | 41 | 67.1 | 21.4 | 59.7 | 12.8 | 9.7 | 0.0 | 139.8 | 82.9 |
| (MEXxBS13) x BS13 | 42 | 67.6 | 19.8 | 58.7 | 22.8 | 13.3 | 0.8 | 144.4 | 85.6 |
| BS13 x (MEXxBS13) | 43 | 56.6 | 22.0 | 59.1 | 40.8 | 5.0 | 0.0 | 129.8 | 86.8 |
| (MEXxBS13) x MEX.DENT | 44 | 52.5 | 20.8 | 60.2 | 18.4 | 7.5 | 0.0 | 131.1 | 83.0 |
| MEX.DENT x (MEXxBS13) | 45 | 56.5 | 20.3 | 55.4 | 26.1 | 12.9 | 0.0 | 132.5 | 81.8 |
| BS13(S)C4 x MEX. DENT | 46 | 63.6 | 20.4 | 56.2 | 12.7 | 8.7 | 0.0 | 130.2 | 84.3 |
| (BS13xMEX) x BS13 | 47 | 59.0 | 20.4 | 62.9 | 17.9 | 10.3 | 0.0 | 137.6 | 85.9 |
| BS13 x (BS13xMEX) | 48 | 66.7 | 20.6 | 58.9 | 9.9 | 5.2 | 0.0 | 133.7 | 85.9 |
| (BS13xMEX) x MEX.DENT | 49 | 62.0 | 20.7 | 56.2 | 32.7 | 12.0 | 0.9 | 123.7 | 81.6 |
| MEX.DENT x (BS13xMEX) | 50 | 61.9 | 19.6 | 58.6 | 17.5 | 9.6 | 0.0 | 122.5 | 81.9 |
| MEXICAN DENT x BS26 | 51 | 64.5 | 20.5 | 60.5 | 10.9 | 14.6 | 0.0 | 134.3 | 81.9 |
| (MEXxBS26) x BS26 | 52 | 55.1 | 20.5 | 55.2 | 8.6 | 13.1 | 1.1 | 129.8 | 81.6 |
| BS26 x (MEXxBS26) | 53 | 49.6 | 20.5 | 57.4 | 8.6 | 11.3 | 0.9 | 132.0 | 82.6 |
| (MEXxBS26) x MEX.DENT | 54 | 55.2 | 19.9 | 60.3 | 10.2 | 12.3 | 0.0 | 125.3 | 81.0 |
| MEX.DENT x (MEXxBS26) | 55 | 51.7 | 19.8 | 63.4 | 22.6 | 17.4 | 0.0 | 126.7 | 82.8 |
| BS26 x MEXICAN DENT | 56 | 48.4 | 19.6 | 61.6 | 11.8 | 9.0 | 0.9 | 126.1 | 81.6 |
| (BS26xMEX) x BS26 | 57 | 54.1 | 21.1 | 55.6 | 14.7 | 11.3 | 0.0 | 128.7 | 82.5 |
| BS26 x (BS26xMEX) | 58 | 63.2 | 20.8 | 41.7 | 25.8 | 18.5 | 1.8 | 138.4 | 82.7 |
| (BS26xMEX) x MEX.DENT | 59 | 51.6 | 21.5 | 50.5 | 17.1 | 4.2 | 0.0 | 135.1 | 81.7 |
| MEX.DENT x (BS26xMEX) | 60 | 62.4 | 21.2 | 58.6 | 11.2 | 3.2 | 0.0 | 122.7 | 81.4 |

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| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 61.8 | 22.0 | 49.0 | 18.8 | 10.9 | 0.0 | 146.8 | 85.8 |
| (ANTxBS13) x BS13 | 62 | 56.5 | 21.5 | 62.9 | 14.4 | 12.1 | 0.0 | 135.9 | 86.9 |
| BS13 x (ANTxBS13) | 63 | 55.6 | 21.5 | 64.0 | 16.1 | 7.1 | 0.0 | 138.5 | 90.1 |
| (ANTxBS13) x ANTIGUA | 64 | 62.9 | 20.6 | 56.3 | 25.2 | 8.5 | 0.0 | 145.4 | 84.8 |
| ANTIGUA x (ANTxBS13) | 65 | 51.1 | 21.1 | 56.4 | 16.1 | 5.3 | 0.8 | 151.7 | 84.2 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 66.5 | 20.8 | 62.4 | 14.8 | 8.5 | 0.0 | 146.1 | 87.3 |
| (BS13xANT) x BS13 | 67 | 61.0 | 19.3 | 56.7 | 12.9 | 12.5 | 0.0 | 134.9 | 86.8 |
| BS13 x (BS13xANT) | 68 | 49.3 | 21.9 | 53.1 | 12.0 | 12.2 | 0.0 | 134.1 | 88.8 |
| (BS13xANT) x ANTIGUA | 69 | 43.8 | 21.6 | 52.7 | 8.6 | 11.5 | 0.0 | 146.4 | 85.6 |
| ANTIGUA x (BS13xANT) | 70 | 61.7 | 21.8 | 53.4 | 13.9 | 15.3 | 0.0 | 149.0 | 86.2 |
| ANTIGUA x BS26 | 71 | 49.3 | 20.0 | 59.2 | 5.2 | 10.5 | 0.0 | 141.2 | 82.9 |
| (ANTxBS26) x BS26 | 72 | 45.7 | 20.5 | 59.0 | 4.0 | 13.2 | 0.0 | 136.2 | 84.3 |
| BS26 x (ANTxBS26) | 73 | 51.7 | 20.6 | 53.2 | 2.7 | 13.0 | 0.0 | 134.7 | 83.0 |
| (ANTxBS26) x ANTIGUA | 74 | 49.2 | 20.4 | 53.1 | 18.3 | 6.8 | 0.0 | 146.7 | 85.3 |
| ANTIGUA x (ANTxBS26) | 75 | 51.8 | 20.8 | 54.5 | 12.2 | 11.1 | 0.0 | 141.0 | 83.0 |
| BS26 x ANTIGUA | 76 | 49.4 | 19.8 | 60.3 | 16.6 | 15.8 | 0.0 | 139.3 | 82.6 |
| (BS26xANT) x BS26 | 77 | 58.7 | 23.4 | 57.3 | 11.2 | 10.8 | 0.0 | 139.9 | 84.0 |
| BS26 x (BS26xANT) | 78 | 51.1 | 19.5 | 58.6 | 8.5 | 17.7 | 0.0 | 138.5 | 82.8 |
| (BS26xANT) x ANTIGUA | 79 | 44.0 | 19.8 | 55.5 | 12.9 | 12.2 | 0.9 | 136.5 | 83.2 |
| ANTIGUA x (BS26xANT) | 80 | 43.8 | 20.6 | 50.1 | 8.9 | 9.6 | 0.9 | 146.0 | 85.0 |
| BS16(S)C4 x BS13(S)C4 | 81 | 51.5 | 19.0 | 55.0 | 20.7 | 10.0 | 0.0 | 133.5 | 82.2 |
| (BS16xBS13) x BS13 | 82 | 55.2 | 19.1 | 57.4 | 12.1 | 6.1 | 0.9 | 129.9 | 84.8 |
| BS13 x (BS16xBS13) | 83 | 49.9 | 20.5 | 58.6 | 3.1 | 16.6 | 0.0 | 143.7 | 85.8 |
| (BS16xBS13) x BS16 | 84 | 57.1 | 19.8 | 52.6 | 14.7 | 7.2 | 0.0 | 128.3 | 82.5 |
| BS16 x (BS16xBS13) | 85 | 54.7 | 19.6 | 51.5 | 6.0 | 9.0 | 0.0 | 130.6 | 82.1 |
| BS13(S)C4 x BS16(S)C4 | 86 | 65.5 | 20.4 | 58.6 | 20.7 | 2.5 | 0.0 | 124.5 | 82.3 |
| (BS13xBS16) x BS13 | 87 | 63.0 | 20.1 | 58.0 | 11.0 | 6.6 | 0.0 | 126.3 | 86.0 |
| BS13 x (BS13xBS16) | 88 | 54.6 | 20.3 | 49.5 | 10.8 | 10.7 | 0.0 | 132.2 | 85.1 |
| (BS13xBS16) x BS16 | 89 | 63.3 | 19.7 | 52.6 | 10.3 | 6.1 | 0.0 | 124.1 | 81.1 |
| BS16 x (BS13xBS16) | 90 | 47.4 | 20.1 | 51.5 | 20.4 | 13.3 | 0.0 | 126.5 | 83.1 |
| BS16(S)C4 x BS26 | 91 | 74.3 | 19.6 | 57.0 | 7.2 | 15.6 | 0.0 | 131.1 | 82.7 |
| (BS16xBS26) x BS26 | 92 | 55.4 | 20.0 | 60.0 | 11.5 | 3.5 | 0.8 | 127.1 | 83.6 |
| BS26 x (BS16xBS26) | 93 | 59.0 | 20.4 | 62.8 | 11.3 | 15.6 | 0.8 | 139.1 | 83.3 |
| (BS16xBS26) x BS16 | 94 | 65.3 | 19.9 | 51.2 | 9.2 | 6.7 | 0.0 | 119.8 | 80.0 |
| BS16 x (BS16xBS26) | 95 | 62.8 | 19.5 | 53.4 | 12.7 | 7.6 | 0.0 | 110.1 | 81.2 |
| BS26 x BS16(S)C4 | 96 | 57.4 | 19.4 | 66.3 | 12.5 | 4.4 | 1.6 | 128.5 | 82.1 |
| (BS26xBS16) x BS26 | 97 | 53.1 | 20.4 | 59.3 | 7.0 | 3.7 | 0.0 | 136.2 | 82.2 |
| BS26 x (BS26xBS16) | 98 | 49.4 | 20.1 | 55.6 | 5.5 | 18.2 | 0.0 | 134.3 | 83.3 |
| (BS26xBS16) x BS16 | 99 | 58.6 | 19.9 | 57.8 | 12.9 | 7.5 | 0.0 | 127.5 | 81.5 |
| BS16 x (BS26xBS16) | 100 | 57.5 | 20.0 | 55.5 | 14.2 | 8.5 | 0.0 | 133.4 | 81.0 |
| BS13(S)C4 x BS26 | 101 | 69.1 | 19.6 | 55.3 | 4.2 | 10.2 | 0.0 | 142.0 | 84.7 |
| (BS13xBS26) x BS26 | 102 | 67.7 | 21.2 | 56.3 | 5.4 | 8.8 | 0.9 | 135.2 | 85.3 |
| BS26 x (BS13xBS26) | 103 | 62.7 | 20.5 | 61.5 | 6.7 | 8.7 | 0.0 | 132.0 | 83.9 |
| (BS13xBS26) x BS13 | 104 | 63.2 | 21.8 | 49.8 | 14.6 | 10.5 | 0.0 | 142.0 | 88.6 |
| BS13 x (BS13xBS26) | 105 | 60.5 | 22.4 | 58.1 | 8.5 | 7.7 | 0.0 | 137.9 | 90.6 |
| BS26 x BS13(S)C4 | 106 | 64.9 | 19.7 | 57.4 | 12.8 | 20.4 | 0.0 | 148.3 | 84.6 |
| (BS26xBS13) x BS26 | 107 | 66.0 | 21.4 | 56.9 | 5.3 | 7.0 | 0.0 | 143.8 | 84.9 |
| BS26 x (BS26xBS13) | 108 | 57.4 | 19.8 | 56.2 | 17.0 | 12.0 | 0.0 | 130.5 | 83.8 |
| (BS26xBS13) x BS13 | 109 | 55.9 | 21.5 | 63.9 | 11.7 | 8.2 | 0.0 | 137.7 | 86.6 |
| BS13 x (BS26xBS13) | 110 | 65.3 | 21.7 | 53.5 | 17.1 | 11.7 | 0.0 | 126.3 | 86.8 |
| SUWAN 1 x BS13(S)C4 | 111 | 54.2 | 25.3 | 58.0 | 29.2 | 13.6 | 0.0 | 169.0 | 93.7 |
| (SUW1xBS13) x BS13 | 112 | 62.5 | 24.3 | 58.6 | 16.6 | 9.2 | 0.0 | 146.6 | 92.7 |
| B73 x MO17 | 113 | 67.9 | 19.4 | 59.2 | 4.7 | 1.2 | 0.0 | 140.3 | 87.7 |
| (SUW1xBS13) x SUWAN 1 | 114 | 22.0 | 27.6 | 36.6 | 12.2 | 6.5 | 0.0 | 171.3 | 102.9 |
| SUWAN 1 x (SUW1xBS13) | 115 | 33.2 | 26.6 | 37.8 | 14.7 | 6.5 | 0.0 | 169.0 | 93.8 |
| BS13(S)C4 x SUWAN 1 | 116 | 53.5 | 26.0 | 52.7 | 26.1 | 7.1 | 0.0 | 164.2 | 93.0 |
| (BS13xSUW1) x BS13 | 117 | 46.6 | 23.6 | 54.2 | 18.3 | 5.5 | 0.0 | 147.0 | 92.8 |
| BS13 x (BS13xSUW1) | 118 | 58.0 | 22.3 | 56.1 | 27.2 | 11.1 | 0.0 | 144.1 | 91.6 |
| (BS13xSUW1) x SUWAN 1 | 119 | 43.4 | 25.6 | 41.8 | 13.4 | 6.2 | 0.0 | 161.2 | 95.5 |
| SUWAN 1 x (BS13xSUW1) | 120 | 48.7 | 26.6 | 48.6 | 15.0 | 5.9 | 0.0 | 173.2 | 94.4 |

AMES AGRONOMY AND AGRICULTURAL ENGINEERING RESEARCH CENTER 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 58.6 | 23.1 | 53.7 | 13.3 | 9.9 | 0.0 | 164.7 | 91.7 |
| (SUW1xBS26) x BS26 | 122 | 55.4 | 23.9 | 53.0 | 16.5 | 14.1 | 0.0 | 161.9 | 90.2 |
| BS26 x (SUW1xBS26) | 123 | 57.6 | 22.5 | 60.1 | 6.2 | 14.2 | 0.0 | 142.4 | 87.0 |
| (SUW1xBS26) x SUWAN 1 | 124 | 37.1 | 26.3 | 52.7 | 25.0 | 8.9 | 0.0 | 155.6 | 95.0 |
| SUWAN 1 x (SUW1xBS26) | 125 | 43.5 | 27.1 | 50.6 | 18.9 | 11.2 | 0.9 | 169.7 | 92.0 |
| BS26 x SUWAN 1 | 126 | 59.7 | 24.2 | 52.1 | 15.9 | 17.2 | 0.0 | 165.1 | 92.3 |
| (BS26xSUW1) x BS26 | 127 | 65.2 | 22.1 | 58.6 | 7.4 | 10.6 | 0.0 | 140.1 | 88.3 |
| BS26 x (BS26xSUW1) | 128 | 74.6 | 23.3 | 54.9 | 8.6 | 6.8 | 0.0 | 148.6 | 88.5 |
| (BS26xSUW1) x SUWAN 1 | 129 | 46.5 | 26.4 | 47.8 | 12.6 | 15.6 | 0.0 | 164.5 | 90.4 |
| SUWAN 1 x (BS26xSUW1) | 130 | 35.0 | 28.3 | 46.7 | 28.5 | 7.8 | 0.0 | 158.5 | 95.6 |
| TUXPENO x BS13(S)C4 | 131 | 75.8 | 22.8 | 54.4 | 18.1 | 7.1 | 0.0 | 154.6 | 86.3 |
| (TUXxBS13) x BS13 | 132 | 54.1 | 20.4 | 58.3 | 12.2 | 8.8 | 0.0 | 139.7 | 90.3 |
| BS13 x (TUXxBS13) | 133 | 54.6 | 21.9 | 61.5 | 14.3 | 13.1 | 0.0 | 136.7 | 88.5 |
| (TUXxBS13) x TUXPENO | 134 | 41.2 | 24.4 | 47.9 | 10.0 | 6.4 | 0.0 | 146.0 | 93.4 |
| TUXPENO x (TUXxBS13) | 135 | 46.5 | 25.1 | 48.6 | 22.7 | 3.6 | 0.0 | 144.7 | 90.6 |
| BS13(S)C4 x TUXPENO | 136 | 61.6 | 22.0 | 59.1 | 30.8 | 5.3 | 0.8 | 145.4 | 86.8 |
| (BS13xTUX) x BS13 | 137 | 63.9 | 20.6 | 54.5 | 12.2 | 3.7 | 0.0 | 140.3 | 88.6 |
| BS13 x (BS13xTUX) | 138 | 50.5 | 22.0 | 59.2 | 19.0 | 9.2 | 0.0 | 143.9 | 88.6 |
| (BS13xTUX) x TUXPENO | 139 | 47.3 | 24.0 | 55.0 | 12.6 | 7.3 | 0.0 | 146.1 | 86.6 |
| TUXPENO x (BS13xTUX) | 140 | 59.5 | 21.6 | 55.4 | 20.1 | 3.9 | 0.0 | 162.7 | 87.8 |
| TUXPENO x BS26 | 141 | 65.6 | 21.1 | 43.2 | 19.1 | 8.1 | 0.0 | 152.3 | 86.3 |
| (TUXxBS26) x BS26 | 142 | 64.3 | 20.9 | 57.3 | 10.4 | 9.6 | 0.0 | 138.4 | 84.7 |
| BS26 x (TUXxBS26) | 143 | 55.0 | 21.4 | 57.5 | 3.8 | 15.3 | 0.0 | 135.9 | 84.8 |
| (TUXxBS26) x TUXPENO | 144 | 43.8 | 24.1 | 56.2 | 16.3 | 9.6 | 0.0 | 152.5 | 89.9 |
| TUXPENO x (TUXxBS26) | 145 | 40.3 | 23.8 | 50.5 | 26.6 | 8.0 | 0.0 | 142.2 | 88.7 |
| BS26 x TUXPENO | 146 | 61.5 | 24.0 | 50.7 | 7.9 | 5.8 | 0.0 | 148.4 | 88.3 |
| (BS26xTUX) x BS26 | 147 | 61.5 | 22.5 | 61.7 | 16.8 | 6.6 | 0.0 | 143.0 | 87.2 |
| BS26 x (BS26xTUX) | 148 | 52.1 | 21.9 | 54.3 | 8.5 | 9.0 | 0.9 | 144.4 | 85.7 |
| (BS26xTUX) x TUXPENO | 149 | 46.2 | 23.4 | 49.2 | 13.0 | 7.8 | 0.0 | 138.9 | 91.1 |
| TUXPENO x (BS26xTUX) | 150 | 41.9 | 24.1 | 49.6 | 10.0 | 2.2 | 0.0 | 153.2 | 91.3 |
| CATETO | 151 | 37.2 | 21.0 | 52.6 | 17.3 | 6.8 | 0.0 | 124.2 | 77.6 |
| BS13(S)C4 | 152 | 57.3 | 19.6 | 59.7 | 9.8 | 0.6 | 0.0 | 126.5 | 89.7 |
| BS26 | 153 | 60.3 | 22.1 | 55.6 | 8.8 | 7.3 | 0.0 | 131.6 | 84.3 |
| CARIBBEAN FLINT | 154 | 21.6 | 20.0 | 32.4 | 4.4 | 4.9 | 0.0 | 103.9 | 83.4 |
| MEXICAN DENT | 155 | 54.3 | 19.8 | 55.3 | 10.9 | 9.1 | 0.0 | 119.3 | 81.9 |
| ANTIGUA(M)C6 | 156 | 47.3 | 20.8 | 57.5 | 18.0 | 13.9 | 0.0 | 150.1 | 83.6 |
| BS16(S)C4 | 157 | 40.2 | 19.6 | 55.1 | 10.6 | 11.6 | 0.0 | 110.1 | 79.4 |
| SUWAN 1 | 158 | 11.7 | 21.8 | 34.2 | 26.1 | 6.9 | 0.0 | 185.1 | 104.1 |
| TUXPENO | 159 | 31.8 | 25.0 | 34.2 | 7.5 | 7.7 | 0.0 | 157.3 | 92.6 |
| BSSS(R)C11 | 160 | 55.9 | 22.9 | 52.6 | 2.3 | 7.3 | 0.9 | 119.8 | 87.6 |
| BSCB1(R)C11 | 161 | 59.8 | 17.9 | 60.7 | 11.4 | 2.4 | 0.0 | 122.5 | 82.7 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 95.2 | 19.6 | 54.9 | 7.0 | 0.8 | 0.0 | 147.2 | 84.7 |
| BS10(FR)C8 | 163 | 61.7 | 19.5 | 59.8 | 6.1 | 12.8 | 0.0 | 132.3 | 86.6 |
| BS11(FR)C8 | 164 | 61.0 | 22.2 | 51.1 | 6.5 | 6.7 | 0.0 | 147.3 | 88.4 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 73.7 | 19.8 | 53.0 | 13.7 | 8.5 | 0.9 | 141.3 | 86.2 |
| BS10C0 | 166 | 55.1 | 21.2 | 56.2 | 3.8 | 14.6 | 0.0 | 137.1 | 87.8 |
| BS11C0 | 167 | 38.6 | 23.4 | 50.4 | 34.5 | 11.6 | 4.0 | 159.9 | 88.5 |
| BS10C0xBS11C0 | 168 | 49.5 | 21.8 | 54.7 | 12.2 | 12.8 | 0.0 | 145.1 | 89.8 |
| Z.P.SYN.PI(M)C3 | 169 | 51.3 | 21.6 | 47.8 | 8.6 | 13.7 | 0.0 | 135.2 | 85.1 |
| EXPERIMENT MEAN | | 54.7 | 21.4 | 55.1 | 13.0 | 9.6 | 0.1 | 137.8 | 85.4 |
| S.E.TREAT. MEAN | | 7.0 | 0.7 | 3.4 | 5.4 | 4.2 | 0.4 | 5.0 | 1.1 |

ATOMIC ENERGY CENTER 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 45.2 | 25.5 | 57.4 | 7.5 | 27.5 | 0.0 | 137.2 | 76.4 |
| (CATxBS13) x BS13 | 2 | 57.2 | 21.0 | 62.2 | 6.5 | 20.2 | 0.0 | 129.6 | 79.1 |
| BS13 x (CATxBS13) | 3 | 44.6 | 21.4 | 61.0 | 3.4 | 27.5 | 0.0 | 133.2 | 77.9 |
| (CATxBS13) x CATETO | 4 | 43.5 | 22.4 | 60.4 | 7.8 | 26.5 | 0.0 | 123.2 | 80.0 |
| CATETO x (CATxBS13) | 5 | 44.3 | 19.3 | 55.6 | 11.3 | 21.2 | 0.0 | 112.1 | 74.4 |
| BS13(S)C4 x CATETO | 6 | 54.0 | 21.1 | 62.2 | 11.9 | 7.5 | 0.0 | 134.9 | 76.2 |
| (BS13xCAT) x BS13 | 7 | 47.7 | 18.5 | 61.0 | 13.9 | 10.6 | 0.0 | 136.0 | 78.3 |
| BS13 x (BS13xCAT) | 8 | 62.7 | 19.7 | 57.4 | 5.3 | 12.2 | 0.0 | 128.9 | 77.9 |
| (BS13xCAT) x CATETO | 9 | 46.5 | 22.1 | 58.6 | 10.5 | 19.6 | 0.0 | 137.5 | 73.9 |
| CATETO x (BS13xCAT) | 10 | 39.4 | 19.3 | 55.6 | 14.9 | 15.3 | 0.0 | 134.2 | 74.0 |
| CATETO x BS26 | 11 | 32.7 | 20.1 | 61.0 | 14.7 | 19.7 | 0.0 | 113.7 | 74.0 |
| (CATxBS26) x BS26 | 12 | 47.4 | 21.3 | 56.8 | 10.1 | 14.3 | 0.0 | 132.9 | 76.5 |
| BS26 x (CATxBS26) | 13 | 42.3 | 22.1 | 58.0 | 7.5 | 21.6 | 1.6 | 141.2 | 77.8 |
| (CATxBS26) x CATETO | 14 | 35.4 | 17.9 | 57.4 | 10.4 | 24.2 | 0.8 | 129.0 | 75.9 |
| CATETO x(CATxBS26) | 15 | 34.8 | 17.7 | 55.0 | 24.0 | 15.3 | 0.0 | 114.8 | 73.9 |
| BS26 x CATETO | 16 | 35.1 | 20.6 | 57.4 | 16.5 | 19.2 | 0.0 | 117.6 | 75.6 |
| (BS26xCAT) x BS26 | 17 | 55.5 | 18.3 | 57.4 | 5.5 | 26.5 | 0.0 | 119.3 | 77.0 |
| BS26 x (BS26xCAT) | 18 | 47.5 | 19.7 | 62.2 | 8.5 | 22.4 | 0.0 | 146.9 | 77.1 |
| (BS26xCAT) x CATETO | 19 | 37.3 | 20.6 | 58.6 | 8.1 | 31.8 | 0.0 | 126.0 | 73.6 |
| CATETO x (BS26xCAT) | 20 | 40.9 | 18.9 | 58.0 | 13.9 | 23.7 | 0.0 | 130.6 | 74.9 |
| CARIB.FL.x BS13(S)C4 | 21 | 80.5 | 20.9 | 59.8 | 7.5 | 22.3 | 0.9 | 131.2 | 76.6 |
| (CARIBxBS13) x BS13 | 22 | 58.0 | 18.6 | 57.4 | 15.3 | 14.6 | 0.0 | 135.4 | 80.9 |
| BS13 x (CARIBxBS13) | 23 | 56.7 | 18.0 | 53.2 | 13.0 | 9.1 | 0.0 | 143.3 | 81.9 |
| (CARIBxBS13) x CARIB | 24 | 72.8 | 22.5 | 55.6 | 3.9 | 19.6 | 0.0 | 128.1 | 76.4 |
| CARIB x (CARIBxBS13) | 25 | 46.7 | 19.4 | 59.8 | 10.7 | 10.4 | 0.0 | 118.5 | 77.0 |
| BS13(S)C4 x CARIB.FLINT | 26 | 58.0 | 21.6 | 56.8 | 3.1 | 21.1 | 0.0 | 137.1 | 77.0 |
| (BS13xCARIB) x BS13 | 27 | 47.0 | 20.8 | 54.4 | 9.1 | 13.2 | 0.0 | 130.7 | 79.1 |
| BS13 x (BS13xCARIB) | 28 | 39.4 | 20.0 | 53.8 | 28.1 | 11.7 | 0.0 | 132.8 | 82.1 |
| (BS13xCARIB) x CARIB | 29 | 42.7 | 21.0 | 59.2 | 6.2 | 15.7 | 0.0 | 127.0 | 76.6 |
| CARIB x (BS13xCARIB) | 30 | 44.3 | 20.2 | 59.2 | 6.7 | 24.8 | 0.0 | 119.6 | 75.0 |
| CARIB.FLINT x BS26 | 31 | 50.3 | 19.5 | 55.6 | 21.6 | 10.0 | 0.8 | 117.5 | 77.6 |
| (CARIBxBS26) x BS26 | 32 | 30.8 | 18.2 | 59.8 | 12.0 | 27.6 | 0.0 | 131.1 | 76.6 |
| BS26 x (CARIBxBS26) | 33 | 58.8 | 19.2 | 61.6 | 4.6 | 17.8 | 0.0 | 129.7 | 78.0 |
| (CARIBxBS26) x CARIB | 34 | 41.6 | 20.2 | 58.6 | 7.1 | 21.4 | 0.0 | 128.0 | 77.0 |
| CARIB x (CARIBxBS26) | 35 | 42.4 | 20.0 | 53.8 | 7.2 | 25.5 | 1.8 | 120.2 | 77.5 |
| BS26 x CARIB.FLINT | 36 | 48.6 | 18.8 | 62.8 | 7.5 | 19.3 | 0.0 | 124.8 | 76.5 |
| (BS26xCARIB) x BS26 | 37 | 43.1 | 19.9 | 59.8 | 5.1 | 26.7 | 0.0 | 123.1 | 77.5 |
| BS26 x (BS26xCARIB) | 38 | 36.2 | 22.0 | 53.8 | 9.9 | 18.0 | 0.0 | 140.5 | 78.5 |
| (BS26xCARIB) x CARIB | 39 | 42.3 | 19.0 | 51.4 | 10.3 | 17.7 | 0.0 | 122.0 | 75.9 |
| CARIB x (BS26xCARIB) | 40 | 28.9 | 18.9 | 60.4 | 8.0 | 19.0 | 0.0 | 112.3 | 77.0 |
| MEX. DENT x BS13(S)C4 | 41 | 61.5 | 20.6 | 54.4 | 36.9 | 10.7 | 0.0 | 139.1 | 77.4 |
| (MEXxBS13) x BS13 | 42 | 57.0 | 19.7 | 61.0 | 8.6 | 11.7 | 0.0 | 129.7 | 78.9 |
| BS13 x (MEXxBS13) | 43 | 49.9 | 20.3 | 56.8 | 16.3 | 18.8 | 0.0 | 127.5 | 80.6 |
| (MEXxBS13) x MEX.DENT | 44 | 45.1 | 19.9 | 55.0 | 11.4 | 19.4 | 0.0 | 126.7 | 77.4 |
| MEX.DENT x (MEXxBS13) | 45 | 54.4 | 19.6 | 57.4 | 15.0 | 7.4 | 0.0 | 130.1 | 77.6 |
| BS13(S)C4 x MEX. DENT | 46 | 49.0 | 18.2 | 56.2 | 10.7 | 19.4 | 0.0 | 126.2 | 78.0 |
| (BS13xMEX) x BS13 | 47 | 36.5 | 21.1 | 64.6 | 26.1 | 17.7 | 0.0 | 132.4 | 80.1 |
| BS13 x (BS13xMEX) | 48 | 54.2 | 21.8 | 60.4 | 9.3 | 13.9 | 0.0 | 136.9 | 78.6 |
| (BS13xMEX) x MEX.DENT | 49 | 44.7 | 20.5 | 56.2 | 19.5 | 22.0 | 0.0 | 126.3 | 76.5 |
| MEX.DENT x (BS13xMEX) | 50 | 55.2 | 18.9 | 58.6 | 20.9 | 15.9 | 0.0 | 117.7 | 76.4 |
| MEXICAN DENT x BS26 | 51 | 39.8 | 19.0 | 55.6 | 7.2 | 25.5 | 0.0 | 131.2 | 77.5 |
| (MEXxBS26) x BS26 | 52 | 19.5 | 31.7 | 61.0 | 5.3 | 27.8 | 0.0 | 124.9 | 76.5 |
| BS26 x (MEXxBS26) | 53 | 41.1 | 19.5 | 58.6 | 7.5 | 34.5 | 0.0 | 126.6 | 77.6 |
| (MEXxBS26) x MEX.DENT | 54 | 52.3 | 16.8 | 64.0 | 9.9 | 17.8 | 0.8 | 114.8 | 76.6 |
| MEX.DENT x (MEXxBS26) | 55 | 35.3 | 19.1 | 60.4 | 10.7 | 21.5 | 0.0 | 127.2 | 76.8 |
| BS26 x MEXICAN DENT | 56 | 49.9 | 19.2 | 58.0 | 10.8 | 20.8 | 0.0 | 121.5 | 75.1 |
| (BS26xMEX) x BS26 | 57 | 40.0 | 20.7 | 54.4 | 9.7 | 17.6 | 0.0 | 131.9 | 77.0 |
| BS26 x (BS26xMEX) | 58 | 46.8 | 20.1 | 56.8 | 10.8 | 31.5 | 0.0 | 133.1 | 78.5 |
| (BS26xMEX) x MEX.DENT | 59 | 40.9 | 21.5 | 63.4 | 26.3 | 11.4 | 0.0 | 126.3 | 76.6 |
| MEX.DENT x (BS26xMEX) | 60 | 31.8 | 19.4 | 53.2 | 11.6 | 23.6 | 0.0 | 130.1 | 77.0 |

ATOMIC ENERGY CENTER 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 30.8 | 20.0 | 53.8 | 25.2 | 16.8 | 0.0 | 144.7 | 80.9 |
| (ANTxBS13) x BS13 | 62 | 52.9 | 20.9 | 59.8 | 28.0 | 8.0 | 0.0 | 143.7 | 80.0 |
| BS13 x (ANTxBS13) | 63 | 49.4 | 21.1 | 62.8 | 13.3 | 18.0 | 0.0 | 138.9 | 83.9 |
| (ANTxBS13) x ANTIGUA | 64 | 61.1 | 22.0 | 54.4 | 30.8 | 11.2 | 0.0 | 148.4 | 80.6 |
| ANTIGUA x (ANTxBS13) | 65 | 49.6 | 20.0 | 56.8 | 24.5 | 14.4 | 1.7 | 150.1 | 81.0 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 44.1 | 21.8 | 57.4 | 10.3 | 15.9 | 0.0 | 130.5 | 80.0 |
| (BS13xANT) x BS13 | 67 | 55.4 | 19.6 | 59.8 | 4.2 | 12.7 | 0.0 | 128.8 | 79.9 |
| BS13 x (BS13xANT) | 68 | 58.8 | 20.4 | 49.6 | 13.4 | 11.8 | 0.0 | 139.4 | 82.6 |
| (BS13xANT) x ANTIGUA | 69 | 53.5 | 19.9 | 54.4 | 24.9 | 15.1 | 0.0 | 139.2 | 78.5 |
| ANTIGUA x (BS13xANT) | 70 | 38.9 | 20.1 | 59.8 | 21.5 | 26.0 | 0.0 | 145.2 | 80.5 |
| ANTIGUA x BS26 | 71 | 57.1 | 19.7 | 56.2 | 7.8 | 38.3 | 0.0 | 140.8 | 80.5 |
| (ANTxBS26) x BS26 | 72 | 36.6 | 20.8 | 57.4 | 6.4 | 33.5 | 0.0 | 139.3 | 78.0 |
| BS26 x (ANTxBS26) | 73 | 35.6 | 19.5 | 59.2 | 9.4 | 22.0 | 0.0 | 116.7 | 77.6 |
| (ANTxBS26) x ANTIGUA | 74 | 28.7 | 20.3 | 59.2 | 10.3 | 23.4 | 0.0 | 154.4 | 81.5 |
| ANTIGUA x (ANTxBS26) | 75 | 37.3 | 19.6 | 58.6 | 21.1 | 16.4 | 0.0 | 140.8 | 79.7 |
| BS26 x ANTIGUA | 76 | 39.4 | 19.0 | 64.0 | 8.1 | 20.8 | 0.0 | 139.0 | 77.7 |
| (BS26xANT) x BS26 | 77 | 45.4 | 21.0 | 60.4 | 6.1 | 19.8 | 0.0 | 137.1 | 77.9 |
| BS26 x (BS26xANT) | 78 | 41.4 | 19.5 | 55.6 | 4.1 | 34.4 | 0.0 | 139.7 | 80.1 |
| (BS26xANT) x ANTIGUA | 79 | 39.8 | 20.5 | 62.8 | 15.3 | 23.6 | 0.0 | 139.2 | 77.5 |
| ANTIGUA x (BS26xANT) | 80 | 42.7 | 19.7 | 59.8 | 7.0 | 42.6 | 0.0 | 159.4 | 79.0 |
| BS16(S)C4 x BS13(S)C4 | 81 | 43.0 | 21.5 | 55.6 | 8.0 | 23.7 | 0.0 | 121.0 | 77.5 |
| (BS16xBS13) x BS13 | 82 | 81.4 | 19.6 | 59.2 | 10.7 | 8.4 | 0.0 | 135.2 | 78.0 |
| BS13 x (BS16xBS13) | 83 | 49.5 | 19.2 | 56.2 | 8.9 | 20.5 | 0.0 | 138.9 | 79.1 |
| (BS16xBS13) x BS16 | 84 | 51.6 | 17.3 | 56.8 | 10.2 | 12.8 | 0.0 | 138.1 | 77.5 |
| BS16 x (BS16xBS13) | 85 | 51.6 | 20.9 | 58.6 | 11.8 | 11.8 | 0.0 | 130.7 | 77.6 |
| BS13(S)C4 x BS16(S)C4 | 86 | 52.1 | 19.7 | 59.2 | 11.6 | 17.9 | 0.0 | 133.4 | 77.5 |
| (BS13xBS16) x BS13 | 87 | 55.6 | 20.8 | 56.8 | 8.2 | 13.2 | 0.0 | 148.3 | 80.4 |
| BS13 x (BS13xBS16) | 88 | 52.4 | 18.5 | 56.8 | 27.0 | 8.1 | 0.0 | 128.4 | 78.9 |
| (BS13xBS16) x BS16 | 89 | 59.6 | 14.7 | 58.6 | 17.6 | 12.2 | 0.0 | 129.3 | 78.0 |
| BS16 x (BS13xBS16) | 90 | 40.1 | 20.7 | 62.2 | 7.2 | 21.9 | 0.0 | 124.6 | 77.0 |
| BS16(S)C4 x BS26 | 91 | 52.5 | 15.8 | 58.6 | 15.7 | 10.0 | 0.0 | 126.0 | 77.0 |
| (BS16xBS26) x BS26 | 92 | 48.0 | 19.3 | 53.8 | 11.0 | 13.4 | 0.0 | 135.3 | 80.0 |
| BS26 x (BS16xBS26) | 93 | 45.0 | 19.0 | 55.0 | 11.6 | 10.0 | 0.0 | 148.0 | 79.2 |
| (BS16xBS26) x BS16 | 94 | 47.0 | 18.6 | 56.8 | 5.8 | 19.8 | 0.9 | 118.0 | 76.0 |
| BS16 x (BS16xBS26) | 95 | 47.0 | 20.3 | 54.4 | 4.9 | 13.7 | 0.0 | 122.2 | 76.1 |
| BS26 x BS16(S)C4 | 96 | 46.7 | 17.4 | 59.8 | 14.6 | 10.8 | 0.0 | 128.3 | 77.4 |
| (BS26xBS16) x BS26 | 97 | 35.5 | 19.3 | 56.8 | 10.0 | 11.5 | 0.0 | 122.9 | 76.5 |
| BS26 x (BS26xBS16) | 98 | 51.4 | 19.1 | 59.8 | 4.5 | 16.6 | 0.0 | 142.7 | 77.5 |
| (BS26xBS16) x BS16 | 99 | 41.3 | 20.4 | 54.4 | 9.3 | 19.9 | 0.0 | 122.3 | 77.9 |
| BS16 x (BS26xBS16) | 100 | 37.1 | 23.8 | 56.8 | 9.0 | 25.5 | 0.0 | 128.2 | 76.6 |
| BS13(S)C4 x BS26 | 101 | 64.6 | 20.5 | 53.8 | 6.5 | 28.3 | 0.0 | 134.2 | 79.5 |
| (BS13xBS26) x BS26 | 102 | 38.8 | 20.2 | 56.8 | 8.8 | 37.8 | 0.0 | 141.3 | 78.4 |
| BS26 x (BS13xBS26) | 103 | 50.1 | 21.4 | 61.0 | 3.4 | 15.6 | 0.0 | 128.9 | 78.4 |
| (BS13xBS26) x BS13 | 104 | 58.5 | 20.8 | 52.0 | 10.4 | 18.5 | 0.0 | 130.6 | 81.0 |
| BS13 x (BS13xBS26) | 105 | 53.2 | 19.6 | 58.0 | 14.8 | 6.8 | 0.0 | 142.8 | 84.6 |
| BS26 x BS13(S)C4 | 106 | 49.5 | 21.4 | 54.4 | 21.5 | 21.1 | 0.0 | 139.2 | 78.5 |
| (BS26xBS13) x BS26 | 107 | 38.1 | 22.1 | 58.6 | 10.8 | 15.0 | 0.0 | 136.1 | 77.9 |
| BS26 x (BS26xBS13) | 108 | 51.8 | 20.6 | 61.6 | 5.1 | 29.6 | 0.0 | 135.9 | 78.8 |
| (BS26xBS13) x BS13 | 109 | 53.0 | 19.9 | 53.2 | 12.3 | 19.4 | 0.0 | 137.3 | 80.0 |
| BS13 x (BS26xBS13) | 110 | 49.3 | 22.6 | 59.8 | 19.7 | 11.2 | 0.0 | 131.3 | 82.1 |
| SUWAN 1 x BS13(S)C4 | 111 | 40.1 | 20.4 | 61.0 | 13.6 | 16.2 | 0.0 | 157.0 | 90.1 |
| (SUW1xBS13) x BS13 | 112 | 41.9 | 23.4 | 57.4 | 13.1 | 7.6 | 0.0 | 150.4 | 87.9 |
| B73 x MO17 | 113 | 50.7 | 22.8 | 58.6 | 22.1 | 12.9 | 1.6 | 151.2 | 78.1 |
| (SUW1xBS13) x SUWAN 1 | 114 | 38.0 | 24.4 | 55.6 | 23.9 | 5.7 | 0.0 | 174.0 | 91.8 |
| SUWAN 1 x (SUW1xBS13) | 115 | 27.9 | 33.6 | 53.8 | 44.6 | 4.3 | 0.0 | 170.9 | 92.0 |
| BS13(S)C4 x SUWAN 1 | 116 | 59.8 | 21.5 | 52.6 | 30.9 | 16.6 | 0.0 | 161.9 | 84.5 |
| (BS13xSUW1) x BS13 | 117 | 61.0 | 20.2 | 52.6 | 15.9 | 10.6 | 0.0 | 147.2 | 85.0 |
| BS13 x (BS13xSUW1) | 118 | 50.5 | 22.3 | 50.8 | 10.5 | 14.7 | 0.0 | 145.9 | 85.1 |
| (BS13xSUW1) x SUWAN 1 | 119 | 42.6 | 26.6 | 50.2 | 18.1 | 27.3 | 0.0 | 169.7 | 89.5 |
| SUWAN 1 x (BS13xSUW1) | 120 | 44.3 | 25.7 | 51.4 | 18.9 | 10.4 | 0.0 | 159.0 | 89.5 |

ATOMIC ENERGY CENTER 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 53.1 | 23.7 | 55.0 | 8.4 | 15.0 | 0.0 | 157.5 | 85.9 |
| (SUW1xBS26) x BS26 | 122 | 44.5 | 24.3 | 58.6 | 14.6 | 12.8 | 0.0 | 150.0 | 86.5 |
| BS26 x (SUW1xBS26) | 123 | 42.6 | 19.7 | 62.2 | 8.8 | 15.0 | 0.0 | 144.7 | 81.3 |
| (SUW1xBS26) x SUWAN 1 | 124 | 38.9 | 26.4 | 53.8 | 42.5 | 15.9 | 0.0 | 158.4 | 90.1 |
| SUWAN 1 x (SUW1xBS26) | 125 | 47.7 | 25.3 | 59.2 | 17.5 | 3.3 | 0.0 | 175.6 | 91.0 |
| BS26 x SUWAN 1 | 126 | 57.5 | 21.5 | 56.2 | 8.7 | 15.9 | 0.0 | 146.9 | 86.7 |
| (BS26xSUW1) x BS26 | 127 | 45.1 | 19.5 | 56.2 | 5.7 | 18.3 | 0.0 | 140.8 | 79.0 |
| BS26 x (BS26xSUW1) | 128 | 47.5 | 23.7 | 61.6 | 8.9 | 12.0 | 0.0 | 146.5 | 80.5 |
| (BS26xSUW1) x SUWAN 1 | 129 | 49.7 | 25.4 | 55.6 | 13.1 | 24.6 | 0.0 | 167.0 | 90.5 |
| SUWAN 1 x (BS26xSUW1) | 130 | 39.0 | 26.9 | 53.8 | 35.0 | 9.3 | 0.0 | 177.0 | 91.8 |
| TUXPENO x BS13(S)C4 | 131 | 76.0 | 23.2 | 53.2 | 18.9 | 19.5 | 0.0 | 146.9 | 82.0 |
| (TUXxBS13) x BS13 | 132 | 55.0 | 18.7 | 55.6 | 15.7 | 9.3 | 0.0 | 140.7 | 84.0 |
| BS13 x (TUXxBS13) | 133 | 49.8 | 22.2 | 56.2 | 10.1 | 11.5 | 0.0 | 138.6 | 83.5 |
| (TUXxBS13) x TUXPENO | 134 | 32.4 | 21.9 | 55.6 | 12.0 | 13.0 | 0.0 | 142.4 | 82.1 |
| TUXPENO x (TUXxBS13) | 135 | 44.4 | 22.2 | 58.0 | 13.8 | 10.0 | 0.0 | 152.6 | 84.0 |
| BS13(S)C4 x TUXPENO | 136 | 56.2 | 18.2 | 57.4 | 22.3 | 4.9 | 0.0 | 138.5 | 80.0 |
| (BS13xTUX) x BS13 | 137 | 61.2 | 21.6 | 60.4 | 18.3 | 10.4 | 0.0 | 137.9 | 80.6 |
| BS13 x (BS13xTUX) | 138 | 44.3 | 21.5 | 59.8 | 13.3 | 16.8 | 0.0 | 134.9 | 84.5 |
| (BS13xTUX) x TUXPENO | 139 | 22.4 | 21.9 | 56.8 | 6.0 | 12.0 | 0.0 | 148.3 | 83.4 |
| TUXPENO x (BS13xTUX) | 140 | 39.3 | 24.8 | 54.4 | 28.2 | 9.0 | 0.0 | 153.4 | 84.4 |
| TUXPENO x BS26 | 141 | 42.3 | 18.5 | 55.0 | 16.3 | 12.8 | 0.0 | 149.2 | 78.5 |
| (TUXxBS26) x BS26 | 142 | 47.7 | 18.9 | 56.8 | 9.1 | 17.9 | 0.0 | 147.1 | 82.9 |
| BS26 x (TUXxBS26) | 143 | 47.3 | 21.1 | 64.6 | 18.3 | 7.5 | 0.0 | 130.4 | 78.5 |
| (TUXxBS26) x TUXPENO | 144 | 47.2 | 21.8 | 57.4 | 16.0 | 13.3 | 0.0 | 136.9 | 80.0 |
| TUXPENO x (TUXxBS26) | 145 | 50.2 | 22.2 | 58.0 | 17.8 | 9.4 | 0.0 | 139.2 | 82.9 |
| BS26 x TUXPENO | 146 | 47.6 | 21.3 | 61.0 | 26.4 | 10.1 | 0.0 | 156.0 | 76.5 |
| (BS26xTUX) x BS26 | 147 | 64.9 | 20.7 | 58.6 | 14.3 | 6.8 | 0.0 | 145.0 | 79.9 |
| BS26 x (BS26xTUX) | 148 | 45.6 | 22.0 | 61.0 | 14.5 | 12.0 | 0.0 | 148.6 | 78.5 |
| (BS26xTUX) x TUXPENO | 149 | 35.4 | 21.6 | 51.4 | 23.6 | 8.6 | 0.0 | 147.4 | 88.1 |
| TUXPENO x (BS26xTUX) | 150 | 29.0 | 20.6 | 55.6 | 22.2 | 8.8 | 0.0 | 148.4 | 85.1 |
| CATETO | 151 | 32.3 | 18.2 | 50.8 | 12.4 | 21.1 | 0.0 | 110.4 | 72.1 |
| BS13(S)C4 | 152 | 49.1 | 19.0 | 58.0 | 22.6 | 12.6 | 0.0 | 116.3 | 83.6 |
| BS26 | 153 | 43.4 | 22.1 | 55.0 | 7.9 | 26.3 | 0.0 | 132.1 | 78.5 |
| CARIBBEAN FLINT | 154 | 46.2 | 20.1 | 52.0 | 5.0 | 7.5 | 0.0 | 117.3 | 75.5 |
| MEXICAN DENT | 155 | 51.9 | 20.3 | 56.8 | 25.8 | 11.7 | 0.0 | 124.3 | 74.6 |
| ANTIGUA(M)C6 | 156 | 41.8 | 21.7 | 57.4 | 19.8 | 27.0 | 0.0 | 149.6 | 80.1 |
| BS16(S)C4 | 157 | 43.6 | 18.4 | 58.0 | 11.1 | 6.3 | 0.0 | 120.7 | 73.5 |
| SUWAN 1 | 158 | 19.3 | 28.8 | 55.0 | 45.9 | 6.8 | 0.0 | 155.8 | 96.0 |
| TUXPENO | 159 | 48.5 | 20.9 | 49.0 | 18.8 | 6.7 | 0.0 | 140.5 | 86.6 |
| BSSS(R)C11 | 160 | 44.0 | 21.8 | 53.2 | 3.7 | 5.8 | 0.0 | 132.1 | 79.9 |
| BSCB1(R)C11 | 161 | 44.5 | 18.1 | 53.2 | 10.8 | 2.9 | 0.0 | 109.0 | 80.6 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 58.8 | 20.3 | 59.2 | 4.2 | 18.8 | 0.0 | 140.8 | 80.1 |
| BS10(FR)C8 | 163 | 35.3 | 19.3 | 51.4 | 13.8 | 15.9 | 0.0 | 137.3 | 83.0 |
| BS11(FR)C8 | 164 | 49.2 | 23.0 | 54.4 | 43.5 | 17.5 | 0.0 | 135.0 | 82.1 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 63.6 | 23.6 | 59.2 | 5.2 | 18.8 | 0.0 | 146.1 | 82.0 |
| BS10C0 | 166 | 44.3 | 19.2 | 55.0 | 8.8 | 27.8 | 0.0 | 138.1 | 80.0 |
| BS11C0 | 167 | 41.0 | 22.6 | 49.6 | 21.1 | 14.0 | 0.0 | 147.3 | 86.4 |
| BS10C0xBS11C0 | 168 | 36.5 | 21.7 | 53.2 | 9.3 | 37.5 | 0.0 | 135.1 | 80.0 |
| Z.P.SYN.PI(M)C3 | 169 | 42.9 | 20.6 | 56.2 | 1.4 | 35.1 | 0.0 | 139.4 | 80.9 |
| EXPERIMENT MEAN | | 46.5 | 20.8 | 57.2 | 13.7 | 17.2 | 0.1 | 136.4 | 80.0 |
| S.E.TREAT. MEAN | | 7.1 | 1.7 | 2.9 | 6.8 | 5.5 | 0.3 | 5.3 | 1.1 |

MARTINSBURG 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING MOIST (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 49.5 | 17.2 | 63.4 | 0.0 | 19.6 | 1.5 |
| (CATxBS13) x BS13 | 2 | 46.0 | 17.4 | 59.2 | 0.3 | 7.4 | 0.0 |
| BS13 x (CATxBS13) | 3 | 47.2 | 15.4 | 59.2 | 1.1 | 23.8 | 0.9 |
| (CATxBS13) x CATETO | 4 | 39.6 | 15.8 | 63.4 | 0.0 | 19.0 | 0.7 |
| CATETO x (CATxBS13) | 5 | 36.5 | 15.6 | 57.4 | 2.2 | 19.7 | 0.8 |
| BS13(S)C4 x CATETO | 6 | 55.5 | 15.5 | 64.6 | 1.7 | 7.0 | 0.7 |
| (BS13xCAT) x BS13 | 7 | 41.5 | 16.9 | 63.4 | 2.1 | 16.2 | 1.4 |
| BS13 x (BS13xCAT) | 8 | 54.4 | 16.6 | 61.0 | 0.0 | 21.9 | 1.4 |
| (BS13xCAT) x CATETO | 9 | 41.5 | 15.6 | 64.0 | 10.4 | 16.9 | 0.7 |
| CATETO x (BS13xCAT) | 10 | 39.7 | 16.6 | 61.6 | 0.0 | 11.9 | 0.0 |
| CATETO x BS26 | 11 | 53.6 | 15.4 | 66.4 | 2.2 | 8.5 | 0.0 |
| (CATxBS26) x BS26 | 12 | 40.6 | 15.9 | 63.4 | 2.4 | 13.8 | 2.4 |
| BS26 x (CATxBS26) | 13 | 57.5 | 16.1 | 65.2 | 0.6 | 10.3 | 2.2 |
| (CATxBS26) x CATETO | 14 | 37.0 | 18.0 | 61.0 | 2.4 | 21.0 | 0.9 |
| CATETO x(CATxBS26) | 15 | 41.8 | 16.4 | 66.4 | 1.4 | 9.4 | 3.1 |
| BS26 x CATETO | 16 | 46.7 | 16.9 | 63.4 | 1.0 | 9.0 | 0.9 |
| (BS26xCAT) x BS26 | 17 | 59.1 | 16.1 | 57.4 | 2.4 | 10.7 | 0.0 |
| BS26 x (BS26xCAT) | 18 | 49.5 | 17.0 | 59.8 | 2.0 | 11.8 | 7.5 |
| (BS26xCAT) x CATETO | 19 | 37.9 | 18.0 | 61.0 | 2.8 | 14.4 | 2.5 |
| CATETO x (BS26xCAT) | 20 | 40.5 | 15.1 | 59.2 | 2.5 | 9.1 | 1.7 |
| CARIB.FL.x BS13(S)C4 | 21 | 60.5 | 16.9 | 61.0 | 0.0 | 14.5 | 0.0 |
| (CARIBxBS13) x BS13 | 22 | 56.2 | 16.1 | 61.6 | 0.0 | 18.3 | 0.9 |
| BS13 x (CARIBxBS13) | 23 | 42.3 | 16.2 | 60.4 | 1.4 | 14.3 | 0.0 |
| (CARIBxBS13) x CARIB | 24 | 43.6 | 16.0 | 61.0 | 1.5 | 8.6 | 1.7 |
| CARIB x (CARIBxBS13) | 25 | 47.2 | 16.2 | 58.6 | 0.4 | 12.1 | 3.6 |
| BS13(S)C4 x CARIB.FLINT | 26 | 49.9 | 17.3 | 61.0 | 0.5 | 5.9 | 0.9 |
| (BS13xCARIB) x BS13 | 27 | 41.9 | 16.7 | 61.6 | 0.0 | 21.3 | 1.5 |
| BS13 x (BS13xCARIB) | 28 | 47.6 | 16.5 | 64.0 | 0.0 | 19.8 | 0.8 |
| (BS13xCARIB) x CARIB | 29 | 49.6 | 15.8 | 55.6 | 1.5 | 7.4 | 0.0 |
| CARIB x (BS13xCARIB) | 30 | 44.9 | 15.2 | 58.0 | 1.9 | 12.1 | 1.7 |
| CARIB.FLINT x BS26 | 31 | 47.5 | 16.6 | 56.2 | 0.0 | 9.9 | 4.5 |
| (CARIBxBS26) x BS26 | 32 | 51.0 | 18.2 | 61.6 | 1.9 | 7.1 | 1.6 |
| BS26 x (CARIBxBS26) | 33 | 51.0 | 16.4 | 58.6 | 1.0 | 6.7 | 1.1 |
| (CARIBxBS26) x CARIB | 34 | 43.9 | 16.8 | 60.4 | 3.3 | 13.4 | 0.0 |
| CARIB x (CARIBxBS26) | 35 | 52.2 | 16.3 | 59.2 | 2.9 | 11.9 | 0.0 |
| BS26 x CARIB.FLINT | 36 | 50.7 | 16.3 | 64.0 | 1.4 | 14.1 | 0.0 |
| (BS26xCARIB) x BS26 | 37 | 51.3 | 16.8 | 63.4 | 3.5 | 9.7 | 0.0 |
| BS26 x (BS26xCARIB) | 38 | 42.2 | 16.0 | 62.2 | 3.5 | 12.7 | 0.0 |
| (BS26xCARIB) x CARIB | 39 | 43.8 | 15.6 | 62.8 | 2.8 | 13.1 | 2.3 |
| CARIB x (BS26xCARIB) | 40 | 38.3 | 15.5 | 60.4 | 1.9 | 13.7 | 0.0 |
| MEX. DENT x BS13(S)C4 | 41 | 51.8 | 14.5 | 62.2 | 0.9 | 9.1 | 1.6 |
| (MEXxBS13) x BS13 | 42 | 52.8 | 15.8 | 61.6 | 0.6 | 9.5 | 0.8 |
| BS13 x (MEXxBS13) | 43 | 54.0 | 15.8 | 61.0 | 1.1 | 18.3 | 0.8 |
| (MEXxBS13) x MEX.DENT | 44 | 48.7 | 15.0 | 61.6 | 2.4 | 10.1 | 0.7 |
| MEX.DENT x (MEXxBS13) | 45 | 47.3 | 15.3 | 59.8 | 3.8 | 13.7 | 4.2 |
| BS13(S)C4 x MEX. DENT | 46 | 56.0 | 14.8 | 64.0 | 2.2 | 13.3 | 0.0 |
| (BS13xMEX) x BS13 | 47 | 48.8 | 16.1 | 64.6 | 0.9 | 19.2 | 0.0 |
| BS13 x (BS13xMEX) | 48 | 43.9 | 15.5 | 61.6 | 0.0 | 18.6 | 1.7 |
| (BS13xMEX) x MEX.DENT | 49 | 47.9 | 16.1 | 63.4 | 1.4 | 12.7 | 0.7 |
| MEX.DENT x (BS13xMEX) | 50 | 36.8 | 14.1 | 61.6 | 7.4 | 3.6 | 1.6 |
| MEXICAN DENT x BS26 | 51 | 50.1 | 16.4 | 60.4 | 0.0 | 6.8 | 4.2 |
| (MEXxBS26) x BS26 | 52 | 46.1 | 16.4 | 59.8 | 2.1 | 9.3 | 1.8 |
| BS26 x (MEXxBS26) | 53 | 45.1 | 15.6 | 62.2 | 1.7 | 10.3 | 3.2 |
| (MEXxBS26) x MEX.DENT | 54 | 37.0 | 17.1 | 62.2 | 1.6 | 9.5 | 2.4 |
| MEX.DENT x (MEXxBS26) | 55 | 37.3 | 15.2 | 59.8 | 2.3 | 12.6 | 3.4 |
| BS26 x MEXICAN DENT | 56 | 49.2 | 15.3 | 64.0 | 0.9 | 7.6 | 0.8 |
| (BS26xMEX) x BS26 | 57 | 54.1 | 16.4 | 59.2 | 0.0 | 9.2 | 2.6 |
| BS26 x (BS26xMEX) | 58 | 61.3 | 17.5 | 62.2 | 2.5 | 13.9 | 2.3 |
| (BS26xMEX) x MEX.DENT | 59 | 52.1 | 15.2 | 66.4 | 4.7 | 14.2 | 0.0 |
| MEX.DENT x (BS26xMEX) | 60 | 43.8 | 14.3 | 64.6 | 4.5 | 10.6 | 1.4 |

MARTINSBURG 1989

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 57.5 | 17.6 | 62.8 | 0.0 | 12.6 | 3.1 |
| (ANTxBS13) x BS13 | 62 | 40.2 | 17.0 | 65.2 | 0.0 | 16.7 | 0.0 |
| BS13 x (ANTxBS13) | 63 | 44.1 | 16.5 | 58.0 | 1.5 | 16.5 | 0.0 |
| (ANTxBS13) x ANTIGUA | 64 | 45.5 | 17.3 | 59.8 | 6.4 | 15.7 | 0.0 |
| ANTIGUA x (ANTxBS13) | 65 | 45.6 | 15.8 | 61.0 | 2.4 | 20.4 | 0.0 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 51.3 | 18.7 | 51.4 | 1.9 | 15.7 | 0.0 |
| (BS13xANT) x BS13 | 67 | 43.1 | 16.5 | 56.8 | 0.7 | 12.5 | 0.9 |
| BS13 x (BS13xANT) | 68 | 45.2 | 16.5 | 58.6 | 0.0 | 15.5 | 0.0 |
| (BS13xANT) x ANTIGUA | 69 | 37.0 | 16.0 | 59.8 | 1.5 | 13.2 | 1.6 |
| ANTIGUA x (BS13xANT) | 70 | 55.7 | 17.3 | 53.8 | 1.4 | 11.2 | 2.7 |
| ANTIGUA x BS26 | 71 | 48.8 | 16.7 | 59.8 | 2.3 | 9.5 | 3.5 |
| (ANTxBS26) x BS26 | 72 | 39.7 | 17.3 | 62.8 | 0.9 | 11.1 | 4.0 |
| BS26 x (ANTxBS26) | 73 | 48.0 | 15.4 | 57.4 | 1.2 | 16.0 | 4.3 |
| (ANTxBS26) x ANTIGUA | 74 | 41.7 | 16.9 | 56.2 | 4.2 | 14.0 | 3.7 |
| ANTIGUA x (ANTxBS26) | 75 | 40.6 | 16.9 | 61.0 | 2.7 | 14.4 | 1.6 |
| BS26 x ANTIGUA | 76 | 39.9 | 15.6 | 62.8 | 2.3 | 13.2 | 3.9 |
| (BS26xANT) x BS26 | 77 | 47.4 | 16.1 | 63.4 | 1.9 | 12.3 | 4.7 |
| BS26 x (BS26xANT) | 78 | 42.5 | 15.6 | 63.4 | 2.8 | 14.6 | 4.0 |
| (BS26xANT) x ANTIGUA | 79 | 42.3 | 16.1 | 61.0 | 3.4 | 16.2 | 1.5 |
| ANTIGUA x (BS26xANT) | 80 | 36.1 | 16.4 | 59.8 | 1.4 | 21.1 | 2.5 |
| BS16(S)C4 x BS13(S)C4 | 81 | 53.2 | 16.0 | 62.8 | 0.0 | 9.2 | 0.8 |
| (BS16xBS13) x BS13 | 82 | 38.9 | 15.3 | 56.8 | 0.0 | 11.7 | 0.0 |
| BS13 x (BS16xBS13) | 83 | 38.0 | 16.0 | 58.0 | 1.3 | 9.7 | 0.0 |
| (BS16xBS13) x BS16 | 84 | 56.9 | 15.9 | 62.8 | 1.9 | 14.1 | 0.0 |
| BS16 x (BS16xBS13) | 85 | 44.5 | 14.7 | 62.8 | 0.9 | 12.9 | 0.0 |
| BS13(S)C4 x BS16(S)C4 | 86 | 47.4 | 15.6 | 57.4 | 0.0 | 5.4 | 0.9 |
| (BS13xBS16) x BS13 | 87 | 50.2 | 15.8 | 61.6 | 1.0 | 15.0 | 0.8 |
| BS13 x (BS13xBS16) | 88 | 43.6 | 15.9 | 57.4 | 0.0 | 20.3 | 0.9 |
| (BS13xBS16) x BS16 | 89 | 47.2 | 15.3 | 60.4 | 0.0 | 14.3 | 3.3 |
| BS16 x (BS13xBS16) | 90 | 44.0 | 15.1 | 55.6 | 2.1 | 15.3 | 0.0 |
| BS16(S)C4 x BS26 | 91 | 51.4 | 15.0 | 53.2 | 1.0 | 12.7 | 2.8 |
| (BS16xBS26) x BS26 | 92 | 43.7 | 15.5 | 61.6 | 1.7 | 11.3 | 4.0 |
| BS26 x (BS16xBS26) | 93 | 48.1 | 14.7 | 62.2 | 1.4 | 5.4 | 3.3 |
| (BS16xBS26) x BS16 | 94 | 52.6 | 16.0 | 56.2 | 1.5 | 11.1 | 6.6 |
| BS16 x (BS16xBS26) | 95 | 45.4 | 16.3 | 61.6 | 1.5 | 7.9 | 3.9 |
| BS26 x BS16(S)C4 | 96 | 46.2 | 14.5 | 59.2 | 6.2 | 14.2 | 3.4 |
| (BS26xBS16) x BS26 | 97 | 55.7 | 15.6 | 62.8 | 0.0 | 7.8 | 0.0 |
| BS26 x (BS26xBS16) | 98 | 40.6 | 16.9 | 58.6 | 2.0 | 5.0 | 0.0 |
| (BS26xBS16) x BS16 | 99 | 47.1 | 14.6 | 58.0 | 1.4 | 10.0 | 0.9 |
| BS16 x (BS26xBS16) | 100 | 41.8 | 14.3 | 59.2 | 0.0 | 10.9 | 1.8 |
| BS13(S)C4 x BS26 | 101 | 50.7 | 15.7 | 62.8 | 1.4 | 20.1 | 0.7 |
| (BS13xBS26) x BS26 | 102 | 42.9 | 15.4 | 63.4 | 1.6 | 22.4 | 2.5 |
| BS26 x (BS13xBS26) | 103 | 50.3 | 16.7 | 61.6 | 1.3 | 7.3 | 1.7 |
| (BS13xBS26) x BS13 | 104 | 56.1 | 16.9 | 60.4 | 2.1 | 17.3 | 0.0 |
| BS13 x (BS13xBS26) | 105 | 56.0 | 17.4 | 61.6 | 2.0 | 12.9 | 0.8 |
| BS26 x BS13(S)C4 | 106 | 59.6 | 16.4 | 65.2 | 1.2 | 9.1 | 0.8 |
| (BS26xBS13) x BS26 | 107 | 45.8 | 17.6 | 61.6 | 0.0 | 17.6 | 0.0 |
| BS26 x (BS26xBS13) | 108 | 52.7 | 16.5 | 64.0 | 1.0 | 15.5 | 3.1 |
| (BS26xBS13) x BS13 | 109 | 50.8 | 17.5 | 61.6 | 0.7 | 14.6 | 0.0 |
| BS13 x (BS26xBS13) | 110 | 44.6 | 17.3 | 57.4 | 0.7 | 14.7 | 0.0 |
| SUWAN 1 x BS13(S)C4 | 111 | 49.0 | 19.3 | 56.2 | 5.5 | 16.8 | 1.0 |
| (SUW1xBS13) x BS13 | 112 | 52.0 | 20.3 | 59.2 | 0.3 | 15.1 | 0.0 |
| B73 x MO17 | 113 | 71.8 | 14.6 | 53.8 | 0.9 | 2.7 | 0.0 |
| (SUW1xBS13) x SUWAN 1 | 114 | 36.0 | 21.3 | 56.8 | 6.4 | 22.8 | 0.0 |
| SUWAN 1 x (SUW1xBS13) | 115 | 55.3 | 20.7 | 62.8 | 5.8 | 11.9 | 0.8 |
| BS13(S)C4 x SUWAN 1 | 116 | 63.1 | 18.0 | 58.0 | 1.0 | 17.3 | 0.0 |
| (BS13xSUW1) x BS13 | 117 | 44.3 | 19.0 | 59.8 | 1.9 | 22.7 | 0.0 |
| BS13 x (BS13xSUW1) | 118 | 50.4 | 16.8 | 58.0 | 1.8 | 19.7 | 1.7 |
| (BS13xSUW1) x SUWAN 1 | 119 | 50.3 | 20.0 | 58.6 | 3.2 | 18.2 | 0.0 |
| SUWAN 1 x (BS13xSUW1) | 120 | 43.5 | 18.8 | 50.8 | 3.8 | 16.6 | 0.0 |

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| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 47.5 | 18.4 | 53.8 | 2.7 | 11.0 | 1.0 |
| (SUW1xBS26) x BS26 | 122 | 43.6 | 17.3 | 58.6 | 4.7 | 12.3 | 2.7 |
| BS26 x (SUW1xBS26) | 123 | 45.2 | 19.2 | 52.6 | 1.4 | 13.5 | 2.6 |
| (SUW1xBS26) x SUWAN 1 | 124 | 32.0 | 19.7 | 52.6 | 2.5 | 25.6 | 1.9 |
| SUWAN 1 x (SUW1xBS26) | 125 | 47.4 | 20.7 | 58.0 | 8.3 | 17.7 | 0.8 |
| BS26 x SUWAN 1 | 126 | 42.1 | 17.5 | 60.4 | 5.8 | 20.2 | 0.0 |
| (BS26xSUW1) x BS26 | 127 | 46.5 | 17.2 | 62.8 | 2.1 | 5.4 | 0.0 |
| BS26 x (BS26xSUW1) | 128 | 53.3 | 17.3 | 57.4 | 0.0 | 9.3 | 2.4 |
| (BS26xSUW1) x SUWAN 1 | 129 | 37.7 | 21.4 | 58.6 | 9.1 | 15.9 | 0.9 |
| SUWAN 1 x (BS26xSUW1) | 130 | 44.5 | 21.9 | 62.2 | 4.1 | 16.1 | 0.0 |
| TUXPENO x BS13(S)C4 | 131 | 51.0 | 17.5 | 56.2 | 2.0 | 6.9 | 0.0 |
| (TUXxBS13) x BS13 | 132 | 50.0 | 17.2 | 60.4 | 1.3 | 16.3 | 1.6 |
| BS13 x (TUXxBS13) | 133 | 55.7 | 16.3 | 60.4 | 2.8 | 14.0 | 0.0 |
| (TUXxBS13) x TUXPENO | 134 | 38.2 | 18.3 | 59.2 | 0.0 | 11.9 | 0.0 |
| TUXPENO x (TUXxBS13) | 135 | 35.2 | 18.5 | 61.6 | 0.6 | 12.4 | 1.5 |
| BS13(S)C4 x TUXPENO | 136 | 59.3 | 17.2 | 61.0 | 1.5 | 10.6 | 0.0 |
| (BS13xTUX) x BS13 | 137 | 51.0 | 16.5 | 61.0 | 0.7 | 13.1 | 0.8 |
| BS13 x (BS13xTUX) | 138 | 70.0 | 18.3 | 61.6 | 0.8 | 11.3 | 0.0 |
| (BS13xTUX) x TUXPENO | 139 | 46.1 | 16.5 | 61.6 | 1.8 | 4.5 | 0.8 |
| TUXPENO x (BS13xTUX) | 140 | 39.2 | 18.3 | 61.0 | 0.5 | 13.8 | 0.0 |
| TUXPENO x BS26 | 141 | 45.5 | 17.3 | 61.6 | 2.4 | 7.5 | 0.0 |
| (TUXxBS26) x BS26 | 142 | 47.1 | 16.4 | 56.8 | 6.0 | 18.8 | 3.1 |
| BS26 x (TUXxBS26) | 143 | 51.2 | 17.3 | 61.0 | 0.5 | 9.4 | 2.5 |
| (TUXxBS26) x TUXPENO | 144 | 48.5 | 17.5 | 58.6 | 5.2 | 9.1 | 1.8 |
| TUXPENO x (TUXxBS26) | 145 | 36.9 | 17.7 | 56.2 | 7.1 | 9.6 | 1.7 |
| BS26 x TUXPENO | 146 | 49.8 | 18.6 | 59.2 | 3.3 | 5.7 | 1.7 |
| (BS26xTUX) x BS26 | 147 | 43.3 | 17.3 | 58.6 | 8.0 | 13.1 | 0.9 |
| BS26 x (BS26xTUX) | 148 | 51.0 | 16.3 | 62.8 | 5.0 | 15.3 | 1.6 |
| (BS26xTUX) x TUXPENO | 149 | 36.5 | 18.4 | 56.8 | 3.0 | 10.2 | 1.7 |
| TUXPENO x (BS26xTUX) | 150 | 37.6 | 17.6 | 58.6 | 2.5 | 4.8 | 0.0 |
| CATETO | 151 | 35.7 | 16.1 | 64.6 | 2.3 | 15.0 | 0.0 |
| BS13(S)C4 | 152 | 37.5 | 16.6 | 58.0 | 1.0 | 15.9 | 0.9 |
| BS26 | 153 | 47.6 | 15.8 | 64.0 | 0.0 | 14.0 | 3.2 |
| CARIBBEAN FLINT | 154 | 30.2 | 15.7 | 54.4 | 1.6 | 5.1 | 1.8 |
| MEXICAN DENT | 155 | 47.1 | 14.7 | 55.6 | 1.8 | 7.8 | 1.0 |
| ANTIGUA(M)C6 | 156 | 42.8 | 15.6 | 54.4 | 7.5 | 24.1 | 3.8 |
| BS16(S)C4 | 157 | 33.4 | 15.5 | 55.6 | 0.6 | 20.3 | 0.9 |
| SUWAN 1 | 158 | 26.8 | 26.4 | 55.6 | 6.7 | 9.5 | 0.0 |
| TUXPENO | 159 | 27.9 | 17.6 | 54.4 | 5.0 | 5.2 | 1.7 |
| BSSS(R)C11 | 160 | 31.4 | 18.2 | 55.6 | 0.0 | 8.4 | 3.7 |
| BSCB1(R)C11 | 161 | 42.0 | 14.6 | 59.2 | 0.0 | 2.6 | 0.9 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 63.7 | 15.3 | 64.0 | 0.0 | 10.5 | 0.0 |
| BS10(FR)C8 | 163 | 44.9 | 15.2 | 55.0 | 0.0 | 19.3 | 1.1 |
| BS11(FR)C8 | 164 | 47.2 | 17.0 | 59.8 | 0.0 | 23.4 | 0.0 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 57.1 | 16.0 | 61.6 | 0.0 | 19.6 | 0.8 |
| BS10C0 | 166 | 35.6 | 15.0 | 55.0 | 1.5 | 15.7 | 2.6 |
| BS11C0 | 167 | 36.7 | 17.8 | 56.8 | 4.3 | 21.8 | 0.9 |
| BS10C0xBS11C0 | 168 | 40.5 | 16.7 | 57.4 | 1.6 | 20.9 | 0.0 |
| Z.P.SYN.PI(M)C3 | 169 | 28.0 | 15.7 | 58.0 | 2.2 | 19.9 | 0.0 |
| EXPERIMENT MEAN | | 46.3 | 16.7 | 60.1 | 2.1 | 13.2 | 1.4 |
| S.E.TREAT. MEAN | | 5.3 | 0.9 | 2.5 | 1.7 | 4.0 | 1.4 |

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| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 62.8 | 26.5 | 60.8 | 0.0 | 8.1 | 0.0 | 114.4 | 94.5 |
| (CATxBS13) x BS13 | 2 | 57.7 | 26.0 | 60.0 | 0.0 | 16.7 | 0.0 | 114.6 | 89.4 |
| BS13 x (CATxBS13) | 3 | 64.2 | 23.9 | 57.5 | 0.0 | 10.7 | 1.9 | 113.8 | 88.5 |
| (CATxBS13) x CATETO | 4 | 55.0 | 23.4 | 58.0 | 0.0 | 17.3 | 1.7 | 107.2 | 86.4 |
| CATETO x (CATxBS13) | 5 | 39.1 | 22.7 | 61.9 | 0.0 | 11.8 | 0.0 | 102.5 | 85.2 |
| BS13(S)C4 x CATETO | 6 | 60.0 | 24.7 | 60.5 | 0.0 | 14.4 | 1.6 | 111.6 | 86.8 |
| (BS13xCAT) x BS13 | 7 | 66.5 | 24.5 | 62.1 | 0.0 | 15.6 | 0.0 | 106.9 | 88.5 |
| BS13 x (BS13xCAT) | 8 | 76.4 | 24.7 | 57.7 | 0.0 | 11.1 | 0.0 | 109.6 | 91.1 |
| (BS13xCAT) x CATETO | 9 | 56.2 | 25.9 | 62.1 | 0.0 | 19.3 | 1.6 | 108.5 | 86.0 |
| CATETO x (BS13xCAT) | 10 | 47.1 | 25.6 | 60.3 | 0.0 | 13.7 | 0.0 | 108.2 | 86.6 |
| CATETO x BS26 | 11 | 61.6 | 26.8 | 61.6 | 0.0 | 4.0 | 1.6 | 109.9 | 86.9 |
| (CATxBS26) x BS26 | 12 | 48.8 | 26.4 | 60.4 | 0.0 | 9.3 | 0.8 | 106.5 | 87.9 |
| BS26 x (CATxBS26) | 13 | 56.2 | 25.8 | 61.4 | 0.0 | 10.5 | 0.8 | 105.2 | 88.7 |
| (CATxBS26) x CATETO | 14 | 41.5 | 26.5 | 61.1 | 0.0 | 12.8 | 0.8 | 105.4 | 86.8 |
| CATETO x(CATxBS26) | 15 | 48.9 | 25.5 | 59.9 | 0.0 | 12.2 | 0.8 | 114.1 | 86.9 |
| BS26 x CATETO | 16 | 51.2 | 24.9 | 61.5 | 0.0 | 14.0 | 0.0 | 100.4 | 84.1 |
| (BS26xCAT) x BS26 | 17 | 59.6 | 26.6 | 58.4 | 0.0 | 8.9 | 0.8 | 104.7 | 85.6 |
| BS26 x (BS26xCAT) | 18 | 61.1 | 26.8 | 60.4 | 0.0 | 14.3 | 0.0 | 110.8 | 88.3 |
| (BS26xCAT) x CATETO | 19 | 45.8 | 25.6 | 61.1 | 0.0 | 18.4 | 0.0 | 108.4 | 87.0 |
| CATETO x (BS26xCAT) | 20 | 53.5 | 24.8 | 58.8 | 0.0 | 16.9 | 0.8 | 100.2 | 86.9 |
| CARIB.FL.x BS13(S)C4 | 21 | 65.6 | 25.8 | 62.3 | 1.6 | 9.8 | 0.8 | 110.7 | 88.0 |
| (CARIBxBS13) x BS13 | 22 | 59.0 | 24.9 | 62.2 | 0.0 | 23.2 | 0.8 | 116.7 | 89.6 |
| BS13 x (CARIBxBS13) | 23 | 64.0 | 23.9 | 58.7 | 0.0 | 11.2 | 0.9 | 117.5 | 92.6 |
| (CARIBxBS13) x CARIB | 24 | 57.9 | 26.5 | 61.5 | 0.0 | 7.4 | 0.0 | 105.5 | 89.4 |
| CARIB x (CARIBxBS13) | 25 | 59.7 | 26.3 | 62.3 | 0.0 | 10.3 | 0.0 | 99.8 | 87.5 |
| BS13(S)C4 x CARIB.FLINT | 26 | 64.7 | 26.6 | 56.8 | 0.0 | 9.7 | 0.8 | 110.7 | 89.1 |
| (BS13xCARIB) x BS13 | 27 | 46.6 | 26.4 | 53.2 | 0.0 | 12.6 | 0.0 | 108.8 | 90.6 |
| BS13 x (BS13xCARIB) | 28 | 67.0 | 27.3 | 61.0 | 0.0 | 12.1 | 0.8 | 117.5 | 92.5 |
| (BS13xCARIB) x CARIB | 29 | 55.5 | 28.3 | 57.9 | 0.0 | 7.2 | 0.0 | 99.6 | 84.9 |
| CARIB x (BS13xCARIB) | 30 | 49.3 | 26.2 | 61.8 | 0.0 | 5.2 | 0.0 | 97.4 | 87.1 |
| CARIB.FLINT x BS26 | 31 | 56.9 | 27.1 | 59.2 | 0.0 | 11.4 | 0.0 | 106.0 | 85.7 |
| (CARIBxBS26) x BS26 | 32 | 68.6 | 25.6 | 61.5 | 0.0 | 12.4 | 1.6 | 109.2 | 87.9 |
| BS26 x (CARIBxBS26) | 33 | 54.5 | 25.8 | 57.8 | 0.0 | 17.8 | 2.6 | 109.3 | 87.7 |
| (CARIBxBS26) x CARIB | 34 | 64.0 | 28.4 | 57.3 | 0.0 | 12.6 | 0.9 | 103.2 | 88.3 |
| CARIB x (CARIBxBS26) | 35 | 47.1 | 28.5 | 59.3 | 0.9 | 8.5 | 0.0 | 106.7 | 87.5 |
| BS26 x CARIB.FLINT | 36 | 50.0 | 25.6 | 60.3 | 0.0 | 14.3 | 0.0 | 107.2 | 86.9 |
| (BS26xCARIB) x BS26 | 37 | 57.1 | 27.0 | 59.5 | 0.0 | 17.8 | 0.0 | 105.0 | 89.6 |
| BS26 x (BS26xCARIB) | 38 | 57.6 | 25.8 | 62.1 | 0.0 | 12.2 | 3.2 | 118.9 | 89.3 |
| (BS26xCARIB) x CARIB | 39 | 54.9 | 25.3 | 61.7 | 0.0 | 12.1 | 0.8 | 98.9 | 86.9 |
| CARIB x (BS26xCARIB) | 40 | 49.1 | 25.3 | 59.7 | 0.0 | 8.5 | 0.9 | 104.2 | 86.4 |
| MEX. DENT x BS13(S)C4 | 41 | 67.5 | 26.0 | 59.8 | 0.0 | 11.8 | 1.7 | 107.4 | 88.7 |
| (MEXxBS13) x BS13 | 42 | 61.5 | 25.4 | 60.4 | 0.0 | 16.0 | 0.0 | 113.9 | 91.0 |
| BS13 x (MEXxBS13) | 43 | 62.5 | 24.0 | 60.9 | 0.0 | 7.8 | 1.6 | 107.8 | 91.3 |
| (MEXxBS13) x MEX.DENT | 44 | 55.5 | 32.7 | 57.1 | 0.0 | 8.8 | 0.0 | 109.6 | 85.5 |
| MEX.DENT x (MEXxBS13) | 45 | 59.3 | 28.5 | 58.9 | 0.0 | 10.3 | 0.0 | 103.4 | 87.6 |
| BS13(S)C4 x MEX. DENT | 46 | 73.7 | 22.9 | 61.5 | 0.8 | 9.6 | 0.8 | 116.3 | 88.3 |
| (BS13xMEX) x BS13 | 47 | 58.9 | 27.1 | 62.0 | 0.0 | 7.0 | 1.6 | 109.8 | 89.1 |
| BS13 x (BS13xMEX) | 48 | 58.8 | 22.6 | 61.2 | 0.0 | 9.1 | 0.0 | 112.7 | 91.5 |
| (BS13xMEX) x MEX.DENT | 49 | 59.2 | 24.0 | 54.6 | 0.0 | 7.9 | 0.0 | 97.2 | 87.4 |
| MEX.DENT x (BS13xMEX) | 50 | 55.8 | 23.8 | 58.6 | 0.0 | 14.1 | 0.8 | 109.1 | 86.3 |
| MEXICAN DENT x BS26 | 51 | 64.5 | 26.5 | 61.1 | 0.0 | 13.0 | 0.0 | 108.3 | 87.5 |
| (MEXxBS26) x BS26 | 52 | 52.5 | 29.5 | 62.2 | 0.0 | 11.3 | 3.2 | 116.3 | 88.5 |
| BS26 x (MEXxBS26) | 53 | 60.0 | 27.5 | 60.6 | 0.0 | 10.8 | 0.0 | 106.9 | 90.0 |
| (MEXxBS26) x MEX.DENT | 54 | 58.5 | 23.1 | 61.6 | 0.0 | 6.0 | 1.6 | 106.0 | 86.8 |
| MEX.DENT x (MEXxBS26) | 55 | 63.5 | 24.3 | 60.8 | 0.0 | 9.6 | 0.0 | 99.9 | 85.7 |
| BS26 x MEXICAN DENT | 56 | 53.7 | 24.0 | 57.5 | 0.0 | 10.0 | 1.6 | 102.0 | 86.4 |
| (BS26xMEX) x BS26 | 57 | 65.5 | 25.2 | 62.1 | 0.0 | 10.7 | 3.2 | 111.6 | 87.2 |
| BS26 x (BS26xMEX) | 58 | 59.3 | 27.4 | 58.0 | 0.0 | 7.8 | 3.2 | 113.6 | 88.5 |
| (BS26xMEX) x MEX.DENT | 59 | 60.9 | 26.8 | 59.1 | 0.0 | 13.7 | 0.8 | 104.6 | 86.8 |
| MEX.DENT x (BS26xMEX) | 60 | 60.1 | 24.6 | 61.4 | 0.0 | 11.0 | 4.8 | 105.5 | 86.4 |

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| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 71.3 | 29.4 | 60.8 | 0.0 | 8.9 | 2.4 | 127.7 | 91.9 |
| (ANTxBS13) x BS13 | 62 | 56.6 | 24.7 | 58.6 | 0.9 | 15.7 | 0.0 | 114.0 | 92.8 |
| BS13 x (ANTxBS13) | 63 | 53.0 | 27.1 | 61.6 | 0.0 | 10.5 | 0.0 | 113.1 | 94.1 |
| (ANTxBS13) x ANTIGUA | 64 | 59.8 | 27.2 | 60.6 | 0.0 | 12.2 | 2.5 | 118.0 | 91.5 |
| ANTIGUA x (ANTxBS13) | 65 | 57.4 | 32.0 | 61.3 | 0.0 | 12.4 | 1.6 | 119.7 | 92.1 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 73.7 | 26.9 | 61.6 | 0.0 | 9.1 | 1.6 | 120.8 | 91.8 |
| (BS13xANT) x BS13 | 67 | 56.8 | 24.3 | 60.7 | 0.0 | 10.4 | 0.0 | 114.8 | 91.9 |
| BS13 x (BS13xANT) | 68 | 56.5 | 26.8 | 61.2 | 0.0 | 4.4 | 0.0 | 116.8 | 93.1 |
| (BS13xANT) x ANTIGUA | 69 | 80.6 | 25.3 | 60.5 | 0.0 | 6.1 | 0.8 | 126.9 | 91.5 |
| ANTIGUA x (BS13xANT) | 70 | 68.4 | 25.8 | 58.1 | 0.0 | 5.7 | 1.6 | 106.1 | 89.5 |
| ANTIGUA x BS26 | 71 | 66.3 | 26.8 | 60.3 | 0.0 | 9.5 | 5.0 | 120.9 | 90.4 |
| (ANTxBS26) x BS26 | 72 | 53.0 | 29.7 | 53.2 | 0.0 | 12.4 | 0.0 | 117.3 | 92.1 |
| BS26 x (ANTxBS26) | 73 | 61.0 | 26.2 | 62.1 | 0.0 | 14.3 | 0.8 | 114.5 | 89.8 |
| (ANTxBS26) x ANTIGUA | 74 | 54.6 | 29.1 | 59.3 | 0.8 | 11.9 | 5.2 | 124.4 | 92.6 |
| ANTIGUA x (ANTxBS26) | 75 | 59.8 | 27.2 | 61.7 | 0.0 | 10.3 | 0.8 | 111.7 | 92.0 |
| BS26 x ANTIGUA | 76 | 58.6 | 25.5 | 62.5 | 0.0 | 12.6 | 0.8 | 111.5 | 89.1 |
| (BS26xANT) x BS26 | 77 | 57.0 | 26.3 | 59.3 | 0.0 | 14.2 | 0.9 | 111.9 | 89.3 |
| BS26 x (BS26xANT) | 78 | 54.4 | 26.4 | 61.7 | 0.0 | 11.8 | 2.4 | 111.2 | 89.0 |
| (BS26xANT) x ANTIGUA | 79 | 61.7 | 28.7 | 58.0 | 0.8 | 12.2 | 2.6 | 122.5 | 91.2 |
| ANTIGUA x (BS26xANT) | 80 | 66.2 | 26.0 | 59.6 | 1.7 | 9.5 | 1.7 | 119.1 | 90.5 |
| BS16(S)C4 x BS13(S)C4 | 81 | 63.6 | 24.0 | 61.4 | 0.0 | 14.3 | 0.0 | 106.5 | 88.5 |
| (BS16xBS13) x BS13 | 82 | 61.2 | 25.1 | 58.2 | 0.0 | 10.3 | 0.0 | 109.7 | 90.5 |
| BS13 x (BS16xBS13) | 83 | 60.3 | 30.7 | 59.7 | 0.9 | 10.0 | 0.0 | 116.2 | 90.9 |
| (BS16xBS13) x BS16 | 84 | 60.0 | 25.3 | 60.4 | 0.0 | 8.0 | 0.0 | 107.8 | 87.9 |
| BS16 x (BS16xBS13) | 85 | 63.5 | 25.1 | 59.4 | 0.0 | 8.7 | 0.8 | 105.3 | 86.3 |
| BS13(S)C4 x BS16(S)C4 | 86 | 54.5 | 25.0 | 55.5 | 0.9 | 13.1 | 0.0 | 104.3 | 85.6 |
| (BS13xBS16) x BS13 | 87 | 69.8 | 22.6 | 61.5 | 0.8 | 13.7 | 0.0 | 106.8 | 90.9 |
| BS13 x (BS13xBS16) | 88 | 64.2 | 22.4 | 57.0 | 0.0 | 8.5 | 0.0 | 105.3 | 92.0 |
| (BS13xBS16) x BS16 | 89 | 46.2 | 28.4 | 57.3 | 0.0 | 11.0 | 0.0 | 108.3 | 88.2 |
| BS16 x (BS13xBS16) | 90 | 59.1 | 24.1 | 60.9 | 0.0 | 14.4 | 0.8 | 103.1 | 86.9 |
| BS16(S)C4 x BS26 | 91 | 54.8 | 24.8 | 60.9 | 0.0 | 12.7 | 0.8 | 107.5 | 86.9 |
| (BS16xBS26) x BS26 | 92 | 67.1 | 27.3 | 60.5 | 0.0 | 9.9 | 3.3 | 100.0 | 89.4 |
| BS26 x (BS16xBS26) | 93 | 49.9 | 24.3 | 61.0 | 0.0 | 22.2 | 0.0 | 117.2 | 90.0 |
| (BS16xBS26) x BS16 | 94 | 51.4 | 24.6 | 61.4 | 0.0 | 8.4 | 2.4 | 107.2 | 86.2 |
| BS16 x (BS16xBS26) | 95 | 60.7 | 26.3 | 61.7 | 0.0 | 7.3 | 0.8 | 103.1 | 86.1 |
| BS26 x BS16(S)C4 | 96 | 60.3 | 27.2 | 60.3 | 0.0 | 3.3 | 0.8 | 112.8 | 88.5 |
| (BS26xBS16) x BS26 | 97 | 72.1 | 23.8 | 62.3 | 0.8 | 9.3 | 0.0 | 108.0 | 88.9 |
| BS26 x (BS26xBS16) | 98 | 72.1 | 26.1 | 62.2 | 0.0 | 9.6 | 0.8 | 110.0 | 87.5 |
| (BS26xBS16) x BS16 | 99 | 63.6 | 24.4 | 60.3 | 0.0 | 12.7 | 0.0 | 109.6 | 87.9 |
| BS16 x (BS26xBS16) | 100 | 59.7 | 24.7 | 59.2 | 0.0 | 8.1 | 0.9 | 107.0 | 86.9 |
| BS13(S)C4 x BS26 | 101 | 72.5 | 25.5 | 61.0 | 0.0 | 14.6 | 0.8 | 115.6 | 91.0 |
| (BS13xBS26) x BS26 | 102 | 64.3 | 26.8 | 61.0 | 0.0 | 22.3 | 0.0 | 120.5 | 91.3 |
| BS26 x (BS13xBS26) | 103 | 63.4 | 25.6 | 62.0 | 0.8 | 12.0 | 2.4 | 107.9 | 91.1 |
| (BS13xBS26) x BS13 | 104 | 66.0 | 24.1 | 62.0 | 0.8 | 7.8 | 0.0 | 112.5 | 94.1 |
| BS13 x (BS13xBS26) | 105 | 77.1 | 26.2 | 59.9 | 0.8 | 8.8 | 0.8 | 118.3 | 93.0 |
| BS26 x BS13(S)C4 | 106 | 80.0 | 23.9 | 58.0 | 0.0 | 9.9 | 2.6 | 121.4 | 91.1 |
| (BS26xBS13) x BS26 | 107 | 69.5 | 26.1 | 61.8 | 0.0 | 10.7 | 1.6 | 114.7 | 89.1 |
| BS26 x (BS26xBS13) | 108 | 67.1 | 28.8 | 60.5 | 0.0 | 10.7 | 0.0 | 113.9 | 89.4 |
| (BS26xBS13) x BS13 | 109 | 49.0 | 24.1 | 61.0 | 0.0 | 10.3 | 4.1 | 115.1 | 92.5 |
| BS13 x (BS26xBS13) | 110 | 58.9 | 24.7 | 61.7 | 0.0 | 7.4 | 0.0 | 115.2 | 93.4 |
| SUWAN 1 x BS13(S)C4 | 111 | 71.3 | 34.3 | 54.5 | 0.9 | 7.2 | 0.9 | 137.2 | 96.4 |
| (SUW1xBS13) x BS13 | 112 | 72.0 | 32.1 | 61.0 | 1.7 | 10.9 | 0.8 | 116.8 | 94.9 |
| B73 x MO17 | 113 | 88.0 | 24.8 | 59.6 | 0.9 | 1.6 | 2.5 | 122.9 | 91.6 |
| (SUW1xBS13) x SUWAN 1 | 114 | 48.3 | 40.5 | 60.1 | 0.0 | 10.2 | 0.0 | 147.7 | 103.5 |
| SUWAN 1 x (SUW1xBS13) | 115 | 36.8 | 40.2 | 57.3 | 3.8 | 3.8 | 0.0 | 147.5 | 102.7 |
| BS13(S)C4 x SUWAN 1 | 116 | 71.4 | 39.4 | 61.0 | 0.0 | 7.4 | 0.0 | 139.4 | 95.9 |
| (BS13xSUW1) x BS13 | 117 | 64.8 | 31.6 | 62.0 | 0.0 | 8.0 | 0.8 | 119.6 | 96.3 |
| BS13 x (BS13xSUW1) | 118 | 56.4 | 28.6 | 58.9 | 0.0 | 6.7 | 1.8 | 120.2 | 96.1 |
| (BS13xSUW1) x SUWAN 1 | 119 | 51.7 | 40.2 | 57.9 | 0.9 | 10.4 | 0.0 | 139.1 | 99.9 |
| SUWAN 1 x (BS13xSUW1) | 120 | 53.5 | 40.4 | 58.2 | 2.6 | 7.2 | 0.0 | 143.7 | 100.2 |

AMES AGRONOMY AND AGRICULTURAL ENGINEERING RESEARCH CENTER 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 59.5 | 35.0 | 60.4 | 0.0 | 8.6 | 3.3 | 144.9 | 97.2 |
| (SUW1xBS26) x BS26 | 122 | 71.2 | 33.5 | 61.0 | 0.0 | 11.4 | 2.4 | 135.2 | 95.9 |
| BS26 x (SUW1xBS26) | 123 | 64.6 | 27.6 | 58.2 | 0.0 | 13.3 | 4.3 | 121.1 | 94.4 |
| (SUW1xBS26) x SUWAN 1 | 124 | 50.7 | 40.2 | 57.8 | 0.9 | 5.7 | 0.9 | 147.8 | 99.8 |
| SUWAN 1 x (SUW1xBS26) | 125 | 50.3 | 39.5 | 58.1 | 0.0 | 6.0 | 1.6 | 152.3 | 101.3 |
| BS26 x SUWAN 1 | 126 | 63.6 | 36.6 | 57.5 | 0.9 | 7.0 | 0.0 | 127.7 | 96.4 |
| (BS26xSUW1) x BS26 | 127 | 58.9 | 36.7 | 58.8 | 0.0 | 9.6 | 2.5 | 116.1 | 95.5 |
| BS26 x (BS26xSUW1) | 128 | 70.5 | 32.0 | 58.6 | 0.0 | 8.9 | 0.8 | 111.2 | 94.0 |
| (BS26xSUW1) x SUWAN 1 | 129 | 53.4 | 39.6 | 59.7 | 1.6 | 6.1 | 0.0 | 148.5 | 100.4 |
| SUWAN 1 x (BS26xSUW1) | 130 | 53.2 | 39.9 | 59.6 | 1.6 | 4.8 | 2.5 | 152.8 | 100.9 |
| TUXPENO x BS13(S)C4 | 131 | 75.5 | 30.8 | 60.3 | 0.0 | 10.0 | 0.0 | 118.8 | 94.5 |
| (TUXxBS13) x BS13 | 132 | 57.2 | 23.7 | 60.7 | 1.6 | 11.9 | 0.0 | 114.2 | 94.5 |
| BS13 x (TUXxBS13) | 133 | 68.4 | 24.9 | 59.7 | 0.0 | 12.9 | 0.0 | 116.2 | 93.3 |
| (TUXxBS13) x TUXPENO | 134 | 54.4 | 37.1 | 56.9 | 3.5 | 5.0 | 1.8 | 115.4 | 96.0 |
| TUXPENO x (TUXxBS13) | 135 | 58.4 | 35.2 | 60.5 | 0.0 | 5.3 | 0.0 | 126.6 | 95.4 |
| BS13(S)C4 x TUXPENO | 136 | 75.9 | 26.6 | 62.1 | 0.0 | 8.3 | 0.0 | 116.2 | 92.6 |
| (BS13xTUX) x BS13 | 137 | 53.3 | 27.8 | 62.4 | 0.0 | 8.1 | 1.6 | 109.6 | 93.0 |
| BS13 x (BS13xTUX) | 138 | 54.8 | 26.6 | 57.9 | 0.8 | 11.1 | 0.8 | 112.3 | 95.3 |
| (BS13xTUX) x TUXPENO | 139 | 68.1 | 32.8 | 62.2 | 0.8 | 4.2 | 0.8 | 114.6 | 94.9 |
| TUXPENO x (BS13xTUX) | 140 | 57.4 | 33.6 | 61.6 | 0.8 | 4.5 | 0.0 | 128.6 | 96.2 |
| TUXPENO x BS26 | 141 | 73.7 | 31.2 | 58.7 | 0.0 | 4.7 | 0.0 | 117.1 | 93.6 |
| (TUXxBS26) x BS26 | 142 | 64.3 | 27.8 | 61.0 | 0.0 | 8.2 | 0.8 | 117.0 | 92.8 |
| BS26 x (TUXxBS26) | 143 | 66.5 | 27.2 | 58.5 | 0.0 | 7.6 | 3.4 | 115.2 | 93.4 |
| (TUXxBS26) x TUXPENO | 144 | 56.8 | 33.7 | 58.5 | 0.9 | 3.4 | 0.0 | 122.3 | 94.9 |
| TUXPENO x (TUXxBS26) | 145 | 55.9 | 35.1 | 59.5 | 0.0 | 3.8 | 1.6 | 127.7 | 95.7 |
| BS26 x TUXPENO | 146 | 63.0 | 32.8 | 56.9 | 0.0 | 2.2 | 0.0 | 118.6 | 94.4 |
| (BS26xTUX) x BS26 | 147 | 67.4 | 27.3 | 59.7 | 0.8 | 7.3 | 1.6 | 116.3 | 92.7 |
| BS26 x (BS26xTUX) | 148 | 52.4 | 26.9 | 62.3 | 0.0 | 6.7 | 1.6 | 120.8 | 91.0 |
| (BS26xTUX) x TUXPENO | 149 | 40.5 | 39.0 | 61.1 | 0.0 | 2.1 | 0.8 | 118.9 | 96.6 |
| TUXPENO x (BS26xTUX) | 150 | 36.9 | 39.9 | 59.1 | 1.8 | 5.2 | 1.6 | 125.3 | 96.0 |
| CATETO | 151 | 32.0 | 26.5 | 61.2 | 0.0 | 11.9 | 0.8 | 91.6 | 85.0 |
| BS13(S)C4 | 152 | 42.3 | 24.8 | 58.5 | 0.0 | 12.3 | 0.0 | 108.1 | 93.7 |
| BS26 | 153 | 66.0 | 26.7 | 58.8 | 0.0 | 8.8 | 0.9 | 109.5 | 92.0 |
| CARIBBEAN FLINT | 154 | 44.9 | 25.6 | 62.2 | 0.0 | 10.3 | 0.0 | 88.7 | 85.4 |
| MEXICAN DENT | 155 | 52.0 | 22.9 | 58.1 | 0.0 | 7.6 | 1.7 | 104.5 | 86.4 |
| ANTIGUA(M)C6 | 156 | 55.1 | 25.2 | 62.3 | 0.0 | 11.7 | 0.0 | 127.9 | 90.9 |
| BS16(S)C4 | 157 | 48.7 | 25.0 | 55.4 | 0.0 | 7.1 | 0.9 | 99.0 | 85.2 |
| SUWAN 1 | 158 | 20.1 | 38.9 | 58.6 | 3.3 | 9.1 | 0.0 | 150.5 | 105.4 |
| TUXPENO | 159 | 30.4 | 40.1 | 56.3 | 1.0 | 4.8 | 2.5 | 125.5 | 97.6 |
| BSSS(R)C11 | 160 | 51.5 | 32.5 | 57.0 | 0.0 | 8.5 | 0.0 | 101.5 | 93.5 |
| BSCB1(R)C11 | 161 | 60.3 | 24.8 | 59.3 | 0.0 | 7.1 | 0.0 | 103.0 | 90.5 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 92.4 | 26.5 | 59.2 | 0.0 | 7.7 | 0.8 | 116.3 | 91.4 |
| BS10(FR)C8 | 163 | 56.3 | 22.3 | 62.2 | 0.0 | 8.0 | 0.0 | 105.3 | 93.0 |
| BS11(FR)C8 | 164 | 63.2 | 27.9 | 62.3 | 0.8 | 9.0 | 0.8 | 117.5 | 93.0 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 85.2 | 25.3 | 62.2 | 0.0 | 9.5 | 1.6 | 118.4 | 92.3 |
| BS10C0 | 166 | 52.4 | 23.8 | 54.6 | 0.0 | 17.5 | 0.0 | 113.2 | 90.9 |
| BS11C0 | 167 | 58.5 | 30.2 | 57.1 | 0.8 | 11.5 | 0.8 | 128.1 | 95.1 |
| BS10C0xBS11C0 | 168 | 60.0 | 26.1 | 58.5 | 0.0 | 17.7 | 1.7 | 111.9 | 92.0 |
| Z.P.SYN.PI(M)C3 | 169 | 46.3 | 30.4 | 61.7 | 0.0 | 11.6 | 2.4 | 110.0 | 94.2 |
| EXPERIMENT MEAN | | 59.2 | 27.9 | 59.9 | 0.3 | 10.2 | 1.0 | 114.3 | 91.0 |
| S.E.TREAT. MEAN | | 5.7 | 1.7 | 1.9 | 0.6 | 3.2 | 1.0 | 4.5 | 1.1 |

ATOMIC ENERGY CENTER 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 71.3 | 18.4 | 57.4 | 0.0 | 6.3 | 0.0 | 110.0 | 83.0 |
| (CATxBS13) x BS13 | 2 | 59.3 | 19.9 | 62.2 | 1.6 | 11.0 | 0.0 | 113.5 | 87.5 |
| BS13 x (CATxBS13) | 3 | 57.9 | 18.6 | 62.2 | 0.0 | 9.6 | 0.0 | 111.6 | 86.5 |
| (CATxBS13) x CATETO | 4 | 53.7 | 20.1 | 60.4 | 0.0 | 9.6 | 0.7 | 97.5 | 82.5 |
| CATETO x (CATxBS13) | 5 | 57.0 | 18.4 | 59.8 | 0.7 | 4.6 | 0.0 | 102.0 | 82.5 |
| BS13(S)C4 x CATETO | 6 | 62.5 | 20.1 | 59.8 | 0.0 | 5.7 | 0.0 | 107.7 | 84.0 |
| (BS13xCAT) x BS13 | 7 | 71.9 | 19.5 | 62.2 | 0.0 | 6.3 | 0.9 | 111.3 | 85.5 |
| BS13 x (BS13xCAT) | 8 | 63.2 | 19.3 | 57.4 | 0.0 | 9.9 | 0.8 | 117.8 | 87.5 |
| (BS13xCAT) x CATETO | 9 | 50.4 | 18.4 | 62.2 | 0.0 | 12.7 | 2.1 | 95.2 | 84.0 |
| CATETO x (BS13xCAT) | 10 | 60.2 | 18.1 | 58.0 | 0.0 | 10.4 | 0.0 | 98.7 | 82.0 |
| CATETO x BS26 | 11 | 59.3 | 19.3 | 62.2 | 0.0 | 8.7 | 0.0 | 98.4 | 83.5 |
| (CATxBS26) x BS26 | 12 | 64.2 | 22.6 | 60.4 | 0.0 | 6.5 | 0.7 | 115.1 | 84.0 |
| BS26 x (CATxBS26) | 13 | 57.3 | 20.6 | 59.8 | 0.0 | 5.5 | 1.0 | 113.9 | 84.5 |
| (CATxBS26) x CATETO | 14 | 54.1 | 19.0 | 58.0 | 0.0 | 16.3 | 0.0 | 104.3 | 84.0 |
| CATETO x(CATxBS26) | 15 | 58.2 | 20.1 | 60.4 | 0.0 | 5.3 | 0.0 | 94.3 | 84.5 |
| BS26 x CATETO | 16 | 70.4 | 17.8 | 61.0 | 0.0 | 2.1 | 4.6 | 83.8 | 84.0 |
| (BS26xCAT) x BS26 | 17 | 65.6 | 20.5 | 59.8 | 0.0 | 0.9 | 0.0 | 104.7 | 84.5 |
| BS26 x (BS26xCAT) | 18 | 71.7 | 20.9 | 62.2 | 0.7 | 3.0 | 0.0 | 115.3 | 84.0 |
| (BS26xCAT) x CATETO | 19 | 53.2 | 19.2 | 60.4 | 0.7 | 6.1 | 0.9 | 91.8 | 82.0 |
| CATETO x (BS26xCAT) | 20 | 58.3 | 16.8 | 62.2 | 0.0 | 2.8 | 0.0 | 95.8 | 84.0 |
| CARIB.FL.x BS13(S)C4 | 21 | 81.0 | 19.0 | 59.8 | 0.0 | 6.5 | 0.7 | 118.7 | 84.5 |
| (CARIBxBS13) x BS13 | 22 | 67.6 | 17.5 | 59.8 | 0.0 | 6.1 | 0.0 | 108.9 | 88.0 |
| BS13 x (CARIBxBS13) | 23 | 69.0 | 18.2 | 60.4 | 0.0 | 12.9 | 0.0 | 114.8 | 91.0 |
| (CARIBxBS13) x CARIB | 24 | 65.3 | 21.5 | 58.6 | 0.0 | 5.3 | 0.7 | 104.6 | 84.0 |
| CARIB x (CARIBxBS13) | 25 | 66.2 | 19.3 | 58.0 | 0.0 | 3.8 | 0.0 | 98.8 | 85.0 |
| BS13(S)C4 x CARIB.FLINT | 26 | 62.5 | 22.5 | 59.8 | 0.0 | 5.4 | 0.0 | 112.7 | 83.5 |
| (BS13xCARIB) x BS13 | 27 | 52.6 | 17.8 | 62.2 | 0.0 | 13.2 | 0.0 | 113.9 | 87.5 |
| BS13 x (BS13xCARIB) | 28 | 56.5 | 20.3 | 61.6 | 0.0 | 6.3 | 0.0 | 112.2 | 89.0 |
| (BS13xCARIB) x CARIB | 29 | 59.7 | 17.5 | 61.6 | 0.0 | 7.1 | 0.6 | 95.6 | 83.5 |
| CARIB x (BS13xCARIB) | 30 | 52.3 | 18.5 | 57.4 | 0.0 | 10.8 | 0.0 | 99.5 | 83.5 |
| CARIB.FLINT x BS26 | 31 | 74.0 | 19.6 | 58.6 | 0.0 | 0.6 | 0.0 | 96.8 | 83.5 |
| (CARIBxBS26) x BS26 | 32 | 75.2 | 17.6 | 61.0 | 0.0 | 3.3 | 0.0 | 94.2 | 85.5 |
| BS26 x (CARIBxBS26) | 33 | 67.7 | 18.3 | 62.2 | 0.0 | 4.4 | 0.0 | 113.0 | 86.0 |
| (CARIBxBS26) x CARIB | 34 | 63.1 | 19.2 | 57.4 | 0.0 | 7.0 | 0.0 | 111.3 | 86.0 |
| CARIB x (CARIBxBS26) | 35 | 53.7 | 21.7 | 61.6 | 0.0 | 6.8 | 0.0 | 108.9 | 84.0 |
| BS26 x CARIB.FLINT | 36 | 56.2 | 21.5 | 59.8 | 0.0 | 4.8 | 0.0 | 101.8 | 84.5 |
| (BS26xCARIB) x BS26 | 37 | 61.5 | 22.0 | 59.8 | 0.9 | 7.1 | 0.0 | 100.6 | 84.0 |
| BS26 x (BS26xCARIB) | 38 | 68.2 | 21.2 | 60.4 | 0.0 | 6.6 | 0.0 | 112.6 | 87.0 |
| (BS26xCARIB) x CARIB | 39 | 71.0 | 17.1 | 61.6 | 0.0 | 3.5 | 0.0 | 99.3 | 83.5 |
| CARIB x (BS26xCARIB) | 40 | 70.0 | 20.3 | 59.2 | 0.0 | 4.8 | 0.0 | 100.4 | 83.5 |
| MEX. DENT x BS13(S)C4 | 41 | 84.0 | 18.3 | 59.8 | 0.0 | 4.6 | 0.0 | 107.2 | 85.5 |
| (MEXxBS13) x BS13 | 42 | 51.7 | 18.6 | 62.2 | 0.0 | 7.1 | 0.7 | 101.1 | 89.0 |
| BS13 x (MEXxBS13) | 43 | 58.7 | 16.9 | 61.6 | 1.6 | 8.0 | 0.0 | 103.0 | 88.5 |
| (MEXxBS13) x MEX.DENT | 44 | 78.5 | 18.7 | 61.6 | 0.0 | 6.3 | 0.0 | 102.2 | 85.0 |
| MEX.DENT x (MEXxBS13) | 45 | 70.1 | 18.6 | 61.0 | 0.9 | 3.0 | 0.0 | 99.0 | 85.0 |
| BS13(S)C4 x MEX. DENT | 46 | 75.7 | 18.1 | 58.6 | 0.0 | 8.0 | 0.0 | 105.2 | 83.5 |
| (BS13xMEX) x BS13 | 47 | 65.0 | 18.3 | 56.8 | 0.0 | 11.8 | 0.0 | 109.2 | 88.5 |
| BS13 x (BS13xMEX) | 48 | 56.6 | 18.6 | 59.2 | 0.0 | 9.5 | 0.0 | 115.4 | 89.0 |
| (BS13xMEX) x MEX.DENT | 49 | 64.6 | 19.5 | 60.4 | 0.0 | 10.4 | 0.0 | 105.2 | 82.5 |
| MEX.DENT x (BS13xMEX) | 50 | 52.1 | 18.9 | 61.0 | 1.8 | 3.1 | 0.0 | 88.3 | 84.0 |
| MEXICAN DENT x BS26 | 51 | 73.0 | 20.2 | 59.2 | 0.0 | 3.3 | 1.0 | 98.2 | 83.5 |
| (MEXxBS26) x BS26 | 52 | 72.8 | 18.7 | 59.2 | 0.8 | 6.5 | 0.0 | 99.6 | 86.5 |
| BS26 x (MEXxBS26) | 53 | 83.2 | 20.5 | 61.6 | 0.7 | 11.9 | 0.0 | 104.6 | 85.0 |
| (MEXxBS26) x MEX.DENT | 54 | 61.0 | 21.1 | 60.4 | 1.1 | 6.2 | 0.0 | 95.9 | 85.5 |
| MEX.DENT x (MEXxBS26) | 55 | 67.8 | 18.8 | 61.6 | 0.0 | 5.4 | 0.0 | 103.8 | 83.5 |
| BS26 x MEXICAN DENT | 56 | 63.1 | 22.1 | 59.2 | 0.0 | 7.8 | 1.4 | 95.1 | 82.5 |
| (BS26xMEX) x BS26 | 57 | 70.0 | 20.0 | 58.6 | 0.9 | 7.7 | 0.9 | 117.8 | 85.0 |
| BS26 x (BS26xMEX) | 58 | 70.4 | 20.7 | 59.8 | 1.3 | 2.8 | 0.0 | 107.4 | 86.5 |
| (BS26xMEX) x MEX.DENT | 59 | 75.8 | 19.5 | 62.2 | 0.0 | 7.6 | 0.0 | 104.0 | 82.5 |
| MEX.DENT x (BS26xMEX) | 60 | 68.4 | 17.9 | 62.2 | 1.1 | 9.4 | 0.0 | 102.5 | 85.5 |

ATOMIC ENERGY CENTER 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 64.4 | 20.3 | 62.2 | 0.2 | 11.1 | 1.0 | 124.0 | 88.5 |
| (ANTxBS13) x BS13 | 62 | 67.5 | 17.9 | 61.0 | 0.0 | 6.3 | 0.0 | 111.7 | 89.0 |
| BS13 x (ANTxBS13) | 63 | 63.8 | 19.2 | 58.6 | 0.9 | 14.8 | 0.0 | 119.3 | 90.0 |
| (ANTxBS13) x ANTIGUA | 64 | 69.2 | 20.2 | 62.2 | 0.0 | 9.3 | 0.0 | 127.7 | 89.0 |
| ANTIGUA x (ANTxBS13) | 65 | 75.7 | 19.0 | 62.2 | 1.8 | 9.9 | 0.0 | 121.9 | 88.0 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 78.5 | 20.7 | 62.2 | 0.0 | 9.3 | 0.0 | 124.3 | 89.0 |
| (BS13xANT) x BS13 | 67 | 62.4 | 18.3 | 61.6 | 0.0 | 7.0 | 0.0 | 115.5 | 88.5 |
| BS13 x (BS13xANT) | 68 | 56.4 | 19.4 | 61.6 | 0.6 | 7.2 | 1.0 | 118.8 | 91.5 |
| (BS13xANT) x ANTIGUA | 69 | 73.5 | 21.6 | 62.2 | 2.4 | 7.8 | 0.0 | 122.3 | 87.0 |
| ANTIGUA x (BS13xANT) | 70 | 85.1 | 19.3 | 62.2 | 0.0 | 5.3 | 0.0 | 123.0 | 89.0 |
| ANTIGUA x BS26 | 71 | 75.9 | 22.5 | 59.8 | 0.0 | 5.9 | 0.0 | 116.7 | 87.5 |
| (ANTxBS26) x BS26 | 72 | 74.4 | 19.4 | 61.6 | 0.0 | 5.5 | 0.8 | 119.6 | 87.5 |
| BS26 x (ANTxBS26) | 73 | 78.5 | 19.4 | 61.6 | 0.0 | 6.0 | 0.0 | 107.8 | 88.0 |
| (ANTxBS26) x ANTIGUA | 74 | 70.1 | 19.8 | 61.0 | 3.2 | 10.0 | 0.0 | 115.6 | 87.0 |
| ANTIGUA x (ANTxBS26) | 75 | 70.1 | 23.4 | 61.6 | 0.4 | 12.3 | 1.9 | 115.1 | 86.5 |
| BS26 x ANTIGUA | 76 | 79.4 | 19.0 | 58.6 | 0.0 | 8.0 | 0.0 | 112.0 | 85.5 |
| (BS26xANT) x BS26 | 77 | 80.8 | 19.2 | 62.2 | 0.0 | 4.9 | 0.0 | 106.1 | 87.0 |
| BS26 x (BS26xANT) | 78 | 61.1 | 17.6 | 56.2 | 0.7 | 7.5 | 1.1 | 110.4 | 86.0 |
| (BS26xANT) x ANTIGUA | 79 | 67.5 | 21.0 | 62.2 | 0.0 | 7.2 | 1.4 | 112.0 | 89.0 |
| ANTIGUA x (BS26xANT) | 80 | 70.7 | 18.9 | 59.2 | 0.0 | 7.2 | 0.9 | 128.3 | 88.0 |
| BS16(S)C4 x BS13(S)C4 | 81 | 85.6 | 17.4 | 60.4 | 0.0 | 1.3 | 0.0 | 99.4 | 83.0 |
| (BS16xBS13) x BS13 | 82 | 64.5 | 19.6 | 59.8 | 0.0 | 5.7 | 0.0 | 105.0 | 87.0 |
| BS13 x (BS16xBS13) | 83 | 72.0 | 18.0 | 62.2 | 0.0 | 6.7 | 0.0 | 110.2 | 88.5 |
| (BS16xBS13) x BS16 | 84 | 61.6 | 17.5 | 62.2 | 0.0 | 4.8 | 0.0 | 107.1 | 85.0 |
| BS16 x (BS16xBS13) | 85 | 66.5 | 19.1 | 56.8 | 0.0 | 3.0 | 0.9 | 107.9 | 83.5 |
| BS13(S)C4 x BS16(S)C4 | 86 | 74.6 | 18.3 | 61.6 | 0.0 | 8.8 | 0.0 | 108.7 | 84.5 |
| (BS13xBS16) x BS13 | 87 | 66.8 | 17.8 | 62.2 | 0.0 | 8.0 | 0.0 | 108.5 | 89.0 |
| BS13 x (BS13xBS16) | 88 | 73.3 | 14.7 | 59.8 | 0.0 | 9.1 | 0.0 | 105.9 | 89.0 |
| (BS13xBS16) x BS16 | 89 | 62.1 | 19.0 | 61.6 | 0.7 | 2.5 | 0.0 | 100.6 | 84.5 |
| BS16 x (BS13xBS16) | 90 | 65.0 | 16.7 | 62.2 | 0.7 | 2.7 | 0.0 | 96.5 | 84.0 |
| BS16(S)C4 x BS26 | 91 | 76.9 | 15.7 | 61.6 | 0.0 | 6.7 | 0.0 | 108.1 | 82.5 |
| (BS16xBS26) x BS26 | 92 | 73.3 | 20.9 | 61.6 | 0.0 | 6.9 | 0.0 | 110.0 | 85.5 |
| BS26 x (BS16xBS26) | 93 | 68.9 | 19.5 | 56.8 | 0.0 | 7.5 | 0.8 | 111.6 | 84.5 |
| (BS16xBS26) x BS16 | 94 | 62.2 | 19.6 | 60.4 | 0.0 | 4.7 | 1.1 | 98.6 | 85.5 |
| BS16 x (BS16xBS26) | 95 | 56.5 | 18.0 | 61.6 | 0.0 | 2.8 | 1.7 | 98.3 | 84.5 |
| BS26 x BS16(S)C4 | 96 | 69.1 | 20.4 | 61.0 | 0.0 | 4.8 | 0.0 | 108.3 | 86.0 |
| (BS26xBS16) x BS26 | 97 | 81.2 | 22.5 | 60.4 | 0.0 | 6.2 | 0.0 | 114.7 | 86.0 |
| BS26 x (BS26xBS16) | 98 | 72.8 | 20.4 | 62.2 | 0.0 | 6.8 | 0.0 | 107.5 | 85.5 |
| (BS26xBS16) x BS16 | 99 | 56.1 | 19.2 | 58.6 | 0.0 | 6.3 | 0.0 | 103.9 | 83.5 |
| BS16 x (BS26xBS16) | 100 | 60.9 | 15.4 | 60.4 | 0.9 | 3.0 | 0.0 | 103.1 | 83.0 |
| BS13(S)C4 x BS26 | 101 | 78.7 | 21.3 | 59.2 | 0.0 | 7.1 | 1.5 | 118.5 | 88.5 |
| (BS13xBS26) x BS26 | 102 | 66.4 | 20.6 | 58.6 | 1.8 | 4.5 | 0.0 | 121.0 | 87.5 |
| BS26 x (BS13xBS26) | 103 | 66.8 | 19.6 | 61.0 | 0.0 | 4.9 | 0.0 | 110.8 | 86.5 |
| (BS13xBS26) x BS13 | 104 | 72.7 | 19.3 | 61.0 | 1.0 | 8.7 | 0.0 | 117.5 | 90.5 |
| BS13 x (BS13xBS26) | 105 | 67.9 | 20.2 | 58.6 | 0.0 | 5.3 | 0.0 | 115.5 | 90.5 |
| BS26 x BS13(S)C4 | 106 | 86.6 | 19.3 | 62.2 | 0.0 | 3.8 | 0.8 | 117.5 | 88.0 |
| (BS26xBS13) x BS26 | 107 | 74.6 | 19.6 | 61.0 | 1.5 | 3.4 | 1.0 | 113.7 | 88.0 |
| BS26 x (BS26xBS13) | 108 | 80.9 | 18.6 | 59.2 | 0.0 | 6.9 | 0.0 | 111.4 | 85.5 |
| (BS26xBS13) x BS13 | 109 | 65.7 | 21.0 | 59.2 | 0.0 | 5.6 | 1.0 | 106.7 | 88.0 |
| BS13 x (BS26xBS13) | 110 | 70.5 | 21.1 | 61.6 | 1.7 | 7.8 | 0.7 | 114.3 | 89.0 |
| SUWAN 1 x BS13(S)C4 | 111 | 89.5 | 25.6 | 62.2 | 0.0 | 3.5 | 0.8 | 146.9 | 94.0 |
| (SUW1xBS13) x BS13 | 112 | 78.2 | 22.1 | 62.2 | 0.0 | 1.3 | 0.0 | 123.7 | 92.5 |
| B73 x MO17 | 113 | 86.2 | 17.1 | 61.6 | 0.0 | 7.3 | 0.0 | 110.4 | 88.5 |
| (SUW1xBS13) x SUWAN 1 | 114 | 55.1 | 39.9 | 61.0 | 2.6 | 1.7 | 0.7 | 151.0 | 101.5 |
| SUWAN 1 x (SUW1xBS13) | 115 | 55.3 | 37.0 | 60.4 | 0.0 | 7.8 | 0.0 | 142.1 | 98.0 |
| BS13(S)C4 x SUWAN 1 | 116 | 88.6 | 25.8 | 59.8 | 2.0 | 2.1 | 0.0 | 139.5 | 93.0 |
| (BS13xSUW1) x BS13 | 117 | 80.4 | 24.2 | 62.2 | 0.8 | 5.6 | 0.0 | 129.1 | 92.5 |
| BS13 x (BS13xSUW1) | 118 | 78.1 | 19.7 | 59.8 | 0.9 | 6.6 | 0.0 | 120.5 | 92.0 |
| (BS13xSUW1) x SUWAN 1 | 119 | 60.9 | 29.7 | 56.2 | 0.0 | 8.1 | 0.0 | 137.2 | 97.0 |
| SUWAN 1 x (BS13xSUW1) | 120 | 56.8 | 37.1 | 60.4 | 0.8 | 7.7 | 0.0 | 143.0 | 97.5 |

ATOMIC ENERGY CENTER 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) | EAR HEIGHT (CM) | DAYS-TO-ANTH. |
|---|---|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 90.2 | 22.6 | 61.6 | 0.0 | 4.5 | 0.0 | 145.4 | 94.5 |
| (SUW1xBS26) x BS26 | 122 | 77.2 | 21.3 | 59.8 | 0.9 | 1.4 | 0.0 | 124.4 | 93.0 |
| BS26 x (SUW1xBS26) | 123 | 78.2 | 23.5 | 60.4 | 0.7 | 4.7 | 0.0 | 128.2 | 91.0 |
| (SUW1xBS26) x SUWAN 1 | 124 | 73.7 | 33.7 | 61.0 | 4.2 | 4.8 | 0.0 | 139.8 | 97.5 |
| SUWAN 1 x (SUW1xBS26) | 125 | 57.4 | 40.1 | 60.4 | 6.9 | 2.5 | 0.0 | 142.0 | 97.5 |
| BS26 x SUWAN 1 | 126 | 62.1 | 28.3 | 60.4 | 1.4 | 6.6 | 0.0 | 142.6 | 96.0 |
| (BS26xSUW1) x BS26 | 127 | 71.4 | 20.1 | 61.0 | 0.0 | 1.7 | 0.8 | 122.4 | 90.5 |
| BS26 x (BS26xSUW1) | 128 | 64.1 | 22.5 | 61.6 | 0.0 | 2.5 | 0.0 | 123.5 | 90.5 |
| (BS26xSUW1) x SUWAN 1 | 129 | 63.5 | 29.5 | 58.6 | 3.7 | 3.1 | 0.0 | 143.7 | 98.0 |
| SUWAN 1 x (BS26xSUW1) | 130 | 55.1 | 40.0 | 60.4 | 2.8 | 3.2 | 0.6 | 144.4 | 99.5 |
| TUXPENO x BS13(S)C4 | 131 | 78.5 | 22.7 | 59.2 | 1.3 | 7.5 | 0.0 | 121.0 | 91.5 |
| (TUXxBS13) x BS13 | 132 | 72.4 | 19.9 | 60.4 | 0.0 | 5.6 | 0.8 | 116.6 | 90.5 |
| BS13 x (TUXxBS13) | 133 | 56.6 | 20.3 | 60.4 | 0.0 | 5.0 | 0.0 | 103.8 | 89.5 |
| (TUXxBS13) x TUXPENO | 134 | 61.2 | 24.1 | 61.0 | 1.4 | 1.6 | 0.0 | 111.0 | 91.5 |
| TUXPENO x (TUXxBS13) | 135 | 56.6 | 25.8 | 58.0 | 1.6 | 7.6 | 0.0 | 115.1 | 91.5 |
| BS13(S)C4 x TUXPENO | 136 | 80.7 | 23.1 | 60.4 | 0.0 | 2.3 | 0.0 | 119.5 | 91.0 |
| (BS13xTUX) x BS13 | 137 | 51.3 | 20.7 | 60.4 | 0.0 | 13.0 | 0.0 | 113.1 | 89.0 |
| BS13 x (BS13xTUX) | 138 | 65.4 | 20.6 | 61.6 | 3.2 | 1.0 | 1.3 | 106.3 | 90.5 |
| (BS13xTUX) x TUXPENO | 139 | 70.8 | 23.3 | 61.0 | 1.0 | 3.5 | 0.0 | 116.9 | 89.5 |
| TUXPENO x (BS13xTUX) | 140 | 71.2 | 22.4 | 62.2 | 0.0 | 5.4 | 0.0 | 115.1 | 92.5 |
| TUXPENO x BS26 | 141 | 72.5 | 22.1 | 59.2 | 0.0 | 3.8 | 0.0 | 136.5 | 93.5 |
| (TUXxBS26) x BS26 | 142 | 75.4 | 23.2 | 59.2 | 0.0 | 3.8 | 1.7 | 123.8 | 92.5 |
| BS26 x (TUXxBS26) | 143 | 75.7 | 20.0 | 61.0 | 0.5 | 4.5 | 0.0 | 115.0 | 88.5 |
| (TUXxBS26) x TUXPENO | 144 | 71.1 | 22.0 | 59.2 | 0.0 | 0.7 | 0.0 | 121.6 | 92.5 |
| TUXPENO x (TUXxBS26) | 145 | 51.8 | 28.1 | 60.4 | 0.0 | 3.0 | 0.0 | 118.3 | 92.0 |
| BS26 x TUXPENO | 146 | 67.8 | 25.9 | 57.4 | 0.0 | 6.5 | 0.0 | 124.2 | 91.5 |
| (BS26xTUX) x BS26 | 147 | 55.7 | 26.2 | 62.2 | 0.0 | 7.0 | 0.0 | 122.9 | 89.5 |
| BS26 x (BS26xTUX) | 148 | 64.8 | 20.6 | 58.6 | 0.0 | 7.6 | 0.8 | 117.8 | 89.0 |
| (BS26xTUX) x TUXPENO | 149 | 60.3 | 26.0 | 57.4 | 2.0 | 1.8 | 0.0 | 114.8 | 94.0 |
| TUXPENO x (BS26xTUX) | 150 | 50.2 | 28.5 | 62.2 | 0.0 | 2.6 | 0.7 | 117.9 | 95.0 |
| CATETO | 151 | 44.9 | 18.1 | 52.6 | 0.0 | 6.8 | 0.0 | 79.3 | 81.5 |
| BS13(S)C4 | 152 | 65.6 | 17.9 | 62.2 | 0.0 | 5.2 | 0.0 | 107.1 | 89.5 |
| BS26 | 153 | 72.6 | 19.5 | 59.2 | 0.0 | 2.8 | 0.0 | 108.2 | 88.5 |
| CARIBBEAN FLINT | 154 | 48.0 | 19.4 | 59.2 | 0.7 | 6.2 | 0.0 | 90.6 | 84.5 |
| MEXICAN DENT | 155 | 59.4 | 16.1 | 59.8 | 0.0 | 6.0 | 1.1 | 101.3 | 83.0 |
| ANTIGUA(M)C6 | 156 | 57.6 | 20.4 | 62.2 | 0.0 | 10.9 | 0.0 | 119.1 | 87.0 |
| BS16(S)C4 | 157 | 57.3 | 17.9 | 57.4 | 0.0 | 4.2 | 0.0 | 90.2 | 84.0 |
| SUWAN 1 | 158 | 34.5 | 40.0 | 58.0 | 1.2 | 5.4 | 0.0 | 149.9 | 103.0 |
| TUXPENO | 159 | 42.9 | 27.1 | 61.6 | 3.2 | 3.4 | 0.0 | 121.3 | 93.5 |
| BSSS(R)C11 | 160 | 56.0 | 22.0 | 62.2 | 0.0 | 4.1 | 0.0 | 110.3 | 90.0 |
| BSCB1(R)C11 | 161 | 53.7 | 17.0 | 58.6 | 0.0 | 0.0 | 0.0 | 87.3 | 87.5 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 84.8 | 19.7 | 61.6 | 0.0 | 4.6 | 0.0 | 110.7 | 87.5 |
| BS10(FR)C8 | 163 | 61.9 | 14.9 | 59.8 | 0.0 | 2.1 | 0.6 | 107.7 | 89.0 |
| BS11(FR)C8 | 164 | 66.4 | 23.2 | 60.4 | 0.0 | 4.9 | 0.0 | 124.7 | 89.5 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 89.6 | 17.6 | 62.2 | 0.0 | 5.0 | 0.0 | 117.0 | 89.0 |
| BS10C0 | 166 | 57.6 | 19.3 | 61.6 | 0.0 | 11.5 | 0.0 | 108.4 | 87.5 |
| BS11C0 | 167 | 73.9 | 23.8 | 59.2 | 0.0 | 5.8 | 0.0 | 121.4 | 92.5 |
| BS10C0xBS11C0 | 168 | 56.1 | 19.9 | 57.4 | 0.0 | 6.5 | 0.0 | 109.4 | 90.0 |
| Z.P.SYN.PI(M)C3 | 169 | 64.5 | 20.8 | 60.4 | 0.0 | 9.7 | 0.0 | 129.5 | 89.5 |
| EXPERIMENT MEAN | | 66.7 | 21.0 | 60.3 | 0.4 | 6.1 | 0.3 | 112.6 | 87.9 |
| S.E.TREAT. MEAN | | 7.3 | 1.6 | 1.6 | 1.0 | 3.1 | 0.6 | 5.3 | 0.9 |

MARTINSBURG 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 57.1 | 19.1 | 59.1 | 0.9 | 21.1 | 0.8 |
| (CATxBS13) x BS13 | 2 | 58.7 | 18.3 | 59.8 | 0.0 | 13.3 | 0.0 |
| BS13 x (CATxBS13) | 3 | 53.3 | 18.9 | 61.6 | 0.0 | 13.0 | 0.0 |
| (CATxBS13) x CATETO | 4 | 49.7 | 19.8 | 62.2 | 0.8 | 16.9 | 0.0 |
| CATETO x (CATxBS13) | 5 | 39.0 | 19.0 | 62.3 | 0.0 | 25.7 | 0.0 |
| BS13(S)C4 x CATETO | 6 | 53.1 | 20.4 | 55.7 | 0.0 | 9.2 | 0.9 |
| (BS13xCAT) x BS13 | 7 | 50.2 | 18.0 | 59.9 | 0.0 | 11.7 | 0.0 |
| BS13 x (BS13xCAT) | 8 | 50.2 | 18.5 | 62.3 | 0.0 | 9.7 | 0.0 |
| (BS13xCAT) x CATETO | 9 | 60.7 | 20.9 | 61.0 | 1.7 | 14.0 | 0.0 |
| CATETO x (BS13xCAT) | 10 | 40.2 | 18.1 | 53.8 | 0.0 | 18.8 | 0.8 |
| CATETO x BS26 | 11 | 53.6 | 20.1 | 62.2 | 0.0 | 11.3 | 1.6 |
| (CATxBS26) x BS26 | 12 | 62.6 | 19.2 | 62.3 | 0.0 | 11.3 | 0.0 |
| BS26 x (CATxBS26) | 13 | 50.5 | 18.9 | 62.2 | 0.0 | 14.5 | 0.8 |
| (CATxBS26) x CATETO | 14 | 45.8 | 20.3 | 61.7 | 0.0 | 12.2 | 0.9 |
| CATETO x(CATxBS26) | 15 | 48.8 | 20.5 | 59.8 | 1.7 | 16.8 | 1.7 |
| BS26 x CATETO | 16 | 55.0 | 19.5 | 61.1 | 0.8 | 10.6 | 0.8 |
| (BS26xCAT) x BS26 | 17 | 53.4 | 19.9 | 61.7 | 0.0 | 16.3 | 1.6 |
| BS26 x (BS26xCAT) | 18 | 52.3 | 19.2 | 56.3 | 0.0 | 4.5 | 0.0 |
| (BS26xCAT) x CATETO | 19 | 45.8 | 20.6 | 61.5 | 0.0 | 7.3 | 1.6 |
| CATETO x (BS26xCAT) | 20 | 47.2 | 20.0 | 58.1 | 0.0 | 18.2 | 0.0 |
| CARIB.FL.x BS13(S)C4 | 21 | 63.4 | 18.8 | 61.6 | 0.0 | 13.8 | 0.0 |
| (CARIBxBS13) x BS13 | 22 | 57.5 | 17.9 | 62.0 | 0.0 | 12.9 | 0.0 |
| BS13 x (CARIBxBS13) | 23 | 55.2 | 18.6 | 58.5 | 0.0 | 8.5 | 0.0 |
| (CARIBxBS13) x CARIB | 24 | 59.9 | 19.8 | 61.0 | 0.0 | 13.9 | 0.0 |
| CARIB x (CARIBxBS13) | 25 | 58.3 | 20.1 | 61.1 | 0.8 | 8.2 | 0.0 |
| BS13(S)C4 x CARIB.FLINT | 26 | 56.7 | 17.7 | 59.2 | 0.0 | 6.9 | 0.0 |
| (BS13xCARIB) x BS13 | 27 | 49.4 | 17.7 | 59.6 | 0.0 | 15.0 | 0.0 |
| BS13 x (BS13xCARIB) | 28 | 59.5 | 20.1 | 62.1 | 0.8 | 8.8 | 0.8 |
| (BS13xCARIB) x CARIB | 29 | 51.9 | 20.0 | 62.0 | 0.8 | 7.2 | 0.0 |
| CARIB x (BS13xCARIB) | 30 | 50.3 | 18.7 | 62.2 | 0.8 | 10.5 | 0.8 |
| CARIB.FLINT x BS26 | 31 | 61.0 | 20.1 | 61.6 | 0.8 | 9.8 | 0.8 |
| (CARIBxBS26) x BS26 | 32 | 57.7 | 19.6 | 61.6 | 0.0 | 13.0 | 0.8 |
| BS26 x (CARIBxBS26) | 33 | 65.3 | 19.3 | 62.1 | 0.0 | 8.0 | 0.0 |
| (CARIBxBS26) x CARIB | 34 | 49.1 | 19.4 | 62.0 | 0.0 | 8.0 | 0.0 |
| CARIB x (CARIBxBS26) | 35 | 40.7 | 21.6 | 60.9 | 3.2 | 8.1 | 0.8 |
| BS26 x CARIB.FLINT | 36 | 59.6 | 20.6 | 61.5 | 0.0 | 10.6 | 0.8 |
| (BS26xCARIB) x BS26 | 37 | 55.1 | 20.8 | 58.6 | 0.0 | 13.7 | 1.6 |
| BS26 x (BS26xCARIB) | 38 | 54.5 | 19.8 | 62.3 | 0.0 | 10.5 | 2.4 |
| (BS26xCARIB) x CARIB | 39 | 53.1 | 19.3 | 61.1 | 0.0 | 13.2 | 0.8 |
| CARIB x (BS26xCARIB) | 40 | 46.3 | 18.9 | 61.1 | 0.0 | 4.1 | 0.8 |
| MEX. DENT x BS13(S)C4 | 41 | 70.6 | 17.6 | 62.1 | 0.0 | 12.9 | 0.0 |
| (MEXxBS13) x BS13 | 42 | 57.7 | 18.1 | 60.5 | 0.0 | 8.4 | 0.0 |
| BS13 x (MEXxBS13) | 43 | 54.2 | 17.1 | 62.2 | 0.0 | 4.8 | 0.8 |
| (MEXxBS13) x MEX.DENT | 44 | 59.3 | 19.4 | 61.7 | 1.6 | 9.0 | 0.0 |
| MEX.DENT x (MEXxBS13) | 45 | 47.4 | 18.8 | 62.3 | 1.6 | 11.3 | 0.8 |
| BS13(S)C4 x MEX. DENT | 46 | 68.4 | 19.0 | 62.2 | 1.6 | 8.0 | 0.0 |
| (BS13xMEX) x BS13 | 47 | 55.7 | 17.3 | 62.2 | 0.0 | 12.1 | 0.0 |
| BS13 x (BS13xMEX) | 48 | 52.6 | 18.4 | 61.0 | 2.5 | 9.8 | 1.6 |
| (BS13xMEX) x MEX.DENT | 49 | 73.3 | 19.0 | 62.2 | 0.0 | 8.8 | 0.0 |
| MEX.DENT x (BS13xMEX) | 50 | 58.2 | 18.2 | 61.4 | 0.0 | 12.1 | 0.8 |
| MEXICAN DENT x BS26 | 51 | 59.0 | 18.8 | 62.1 | 0.0 | 4.8 | 0.0 |
| (MEXxBS26) x BS26 | 52 | 61.7 | 19.5 | 61.5 | 3.2 | 8.2 | 0.8 |
| BS26 x (MEXxBS26) | 53 | 57.5 | 18.8 | 62.3 | 0.0 | 11.3 | 0.0 |
| (MEXxBS26) x MEX.DENT | 54 | 55.3 | 19.5 | 58.5 | 0.0 | 6.6 | 0.9 |
| MEX.DENT x (MEXxBS26) | 55 | 57.7 | 19.3 | 61.6 | 0.8 | 13.0 | 0.0 |
| BS26 x MEXICAN DENT | 56 | 71.1 | 18.8 | 62.2 | 0.8 | 7.2 | 0.8 |
| (BS26xMEX) x BS26 | 57 | 56.8 | 20.6 | 61.6 | 0.0 | 9.0 | 1.6 |
| BS26 x (BS26xMEX) | 58 | 58.7 | 21.0 | 62.2 | 2.4 | 12.9 | 0.0 |
| (BS26xMEX) x MEX.DENT | 59 | 52.4 | 19.8 | 62.2 | 0.0 | 12.9 | 1.6 |
| MEX.DENT x (BS26xMEX) | 60 | 64.8 | 18.1 | 61.6 | 1.6 | 6.5 | 2.5 |

MARTINSBURG 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 71.8 | 19.3 | 61.7 | 0.0 | 13.0 | 1.6 |
| (ANTxBS13) x BS13 | 62 | 70.6 | 18.8 | 60.4 | 0.0 | 8.3 | 0.0 |
| BS13 x (ANTxBS13) | 63 | 60.0 | 19.1 | 60.5 | 0.0 | 8.3 | 0.0 |
| (ANTxBS13) x ANTIGUA | 64 | 63.6 | 20.5 | 62.3 | 0.8 | 18.5 | 0.0 |
| ANTIGUA x (ANTxBS13) | 65 | 55.7 | 18.4 | 62.3 | 0.0 | 10.5 | 0.8 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 59.3 | 19.9 | 58.1 | 0.8 | 14.9 | 0.0 |
| (BS13xANT) x BS13 | 67 | 54.8 | 18.3 | 60.9 | 0.0 | 10.7 | 0.0 |
| BS13 x (BS13xANT) | 68 | 57.7 | 18.6 | 61.5 | 0.0 | 16.3 | 0.0 |
| (BS13xANT) x ANTIGUA | 69 | 53.9 | 20.4 | 59.2 | 2.6 | 14.2 | 0.0 |
| ANTIGUA x (BS13xANT) | 70 | 60.2 | 19.0 | 62.2 | 2.4 | 8.0 | 0.0 |
| ANTIGUA x BS26 | 71 | 65.3 | 21.4 | 59.8 | 0.0 | 5.8 | 0.9 |
| (ANTxBS26) x BS26 | 72 | 63.5 | 20.7 | 62.3 | 0.0 | 12.1 | 1.6 |
| BS26 x (ANTxBS26) | 73 | 56.0 | 18.8 | 59.3 | 0.0 | 14.3 | 0.0 |
| (ANTxBS26) x ANTIGUA | 74 | 56.0 | 19.5 | 61.0 | 1.7 | 13.1 | 0.0 |
| ANTIGUA x (ANTxBS26) | 75 | 67.5 | 20.3 | 60.2 | 0.0 | 8.2 | 0.0 |
| BS26 x ANTIGUA | 76 | 63.3 | 18.8 | 61.0 | 0.0 | 18.1 | 0.0 |
| (BS26xANT) x BS26 | 77 | 52.0 | 19.0 | 62.3 | 0.0 | 12.1 | 0.0 |
| BS26 x (BS26xANT) | 78 | 56.0 | 19.4 | 62.2 | 0.8 | 10.5 | 0.8 |
| (BS26xANT) x ANTIGUA | 79 | 64.8 | 22.3 | 62.0 | 3.2 | 16.9 | 1.6 |
| ANTIGUA x (BS26xANT) | 80 | 52.8 | 19.7 | 62.2 | 0.8 | 18.5 | 0.8 |
| BS16(S)C4 x BS13(S)C4 | 81 | 60.2 | 19.4 | 62.2 | 0.0 | 14.5 | 0.8 |
| (BS16xBS13) x BS13 | 82 | 64.0 | 18.5 | 62.2 | 0.8 | 13.7 | 0.8 |
| BS13 x (BS16xBS13) | 83 | 62.8 | 18.0 | 61.9 | 0.0 | 7.2 | 0.0 |
| (BS16xBS13) x BS16 | 84 | 57.7 | 19.3 | 59.2 | 0.0 | 12.0 | 1.8 |
| BS16 x (BS16xBS13) | 85 | 62.3 | 17.7 | 61.2 | 0.0 | 11.4 | 0.0 |
| BS13(S)C4 x BS16(S)C4 | 86 | 59.5 | 17.3 | 55.7 | 0.0 | 6.0 | 2.5 |
| (BS13xBS16) x BS13 | 87 | 60.4 | 17.3 | 58.7 | 1.7 | 1.7 | 0.0 |
| BS13 x (BS13xBS16) | 88 | 57.8 | 18.0 | 61.6 | 0.0 | 4.1 | 0.8 |
| (BS13xBS16) x BS16 | 89 | 66.2 | 18.6 | 62.3 | 2.4 | 5.6 | 1.6 |
| BS16 x (BS13xBS16) | 90 | 62.2 | 18.9 | 62.2 | 0.8 | 10.5 | 0.0 |
| BS16(S)C4 x BS26 | 91 | 64.0 | 17.9 | 61.6 | 0.0 | 11.4 | 0.8 |
| (BS16xBS26) x BS26 | 92 | 59.1 | 19.6 | 59.9 | 0.0 | 15.1 | 0.0 |
| BS26 x (BS16xBS26) | 93 | 51.0 | 20.9 | 61.6 | 0.8 | 13.8 | 0.8 |
| (BS16xBS26) x BS16 | 94 | 63.5 | 19.1 | 60.3 | 0.0 | 7.4 | 0.0 |
| BS16 x (BS16xBS26) | 95 | 56.5 | 18.7 | 57.2 | 0.0 | 11.2 | 0.9 |
| BS26 x BS16(S)C4 | 96 | 64.5 | 18.9 | 51.4 | 0.0 | 5.9 | 0.0 |
| (BS26xBS16) x BS26 | 97 | 69.9 | 19.3 | 61.5 | 0.0 | 4.1 | 0.0 |
| BS26 x (BS26xBS16) | 98 | 78.1 | 18.8 | 60.4 | 0.0 | 4.9 | 0.9 |
| (BS26xBS16) x BS16 | 99 | 60.1 | 18.9 | 61.6 | 0.8 | 11.3 | 0.0 |
| BS16 x (BS26xBS16) | 100 | 49.7 | 17.6 | 61.0 | 0.0 | 13.0 | 0.0 |
| BS13(S)C4 x BS26 | 101 | 71.0 | 20.1 | 61.6 | 0.0 | 8.1 | 1.6 |
| (BS13xBS26) x BS26 | 102 | 62.5 | 19.1 | 62.2 | 0.8 | 13.7 | 2.4 |
| BS26 x (BS13xBS26) | 103 | 69.3 | 18.8 | 62.2 | 0.0 | 9.7 | 1.6 |
| (BS13xBS26) x BS13 | 104 | 57.7 | 18.9 | 61.5 | 0.8 | 13.1 | 0.0 |
| BS13 x (BS13xBS26) | 105 | 65.7 | 19.0 | 62.4 | 0.0 | 13.7 | 1.6 |
| BS26 x BS13(S)C4 | 106 | 66.0 | 19.5 | 62.0 | 0.0 | 11.3 | 0.0 |
| (BS26xBS13) x BS26 | 107 | 52.7 | 18.6 | 59.9 | 0.0 | 15.1 | 1.6 |
| BS26 x (BS26xBS13) | 108 | 59.5 | 19.0 | 61.8 | 0.0 | 12.2 | 1.6 |
| (BS26xBS13) x BS13 | 109 | 59.2 | 18.3 | 62.2 | 0.8 | 8.8 | 0.8 |
| BS13 x (BS26xBS13) | 110 | 69.8 | 18.8 | 61.6 | 2.4 | 8.9 | 0.8 |
| SUWAN 1 x BS13(S)C4 | 111 | 76.6 | 24.9 | 62.2 | 0.8 | 6.4 | 1.6 |
| (SUW1xBS13) x BS13 | 112 | 65.1 | 21.4 | 59.2 | 0.0 | 9.9 | 0.0 |
| B73 x MO17 | 113 | 83.9 | 17.5 | 52.4 | 0.0 | 0.0 | 0.0 |
| (SUW1xBS13) x SUWAN 1 | 114 | 57.1 | 29.2 | 58.1 | 1.7 | 6.9 | 0.0 |
| SUWAN 1 x (SUW1xBS13) | 115 | 48.9 | 29.4 | 56.8 | 2.6 | 14.9 | 0.0 |
| BS13(S)C4 x SUWAN 1 | 116 | 73.8 | 24.1 | 59.0 | 2.6 | 12.6 | 0.9 |
| (BS13xSUW1) x BS13 | 117 | 70.0 | 24.5 | 61.6 | 2.4 | 12.2 | 0.0 |
| BS13 x (BS13xSUW1) | 118 | 55.2 | 21.5 | 62.2 | 0.8 | 16.9 | 0.0 |
| (BS13xSUW1) x SUWAN 1 | 119 | 61.6 | 26.7 | 61.0 | 2.5 | 4.9 | 0.9 |
| SUWAN 1 x (BS13xSUW1) | 120 | 62.8 | 28.8 | 59.8 | 0.0 | 4.2 | 0.0 |

MARTINSBURG 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 74.6 | 23.7 | 62.2 | 5.6 | 7.2 | 0.0 |
| (SUW1xBS26) x BS26 | 122 | 69.3 | 20.8 | 62.3 | 0.8 | 7.2 | 0.8 |
| BS26 x (SUW1xBS26) | 123 | 58.3 | 22.3 | 61.0 | 0.0 | 6.6 | 0.8 |
| (SUW1xBS26) x SUWAN 1 | 124 | 52.9 | 29.5 | 59.3 | 2.6 | 10.2 | 1.7 |
| SUWAN 1 x (SUW1xBS26) | 125 | 61.7 | 26.9 | 62.2 | 2.4 | 9.7 | 0.8 |
| BS26 x SUWAN 1 | 126 | 79.5 | 24.6 | 62.3 | 0.0 | 8.8 | 0.0 |
| (BS26xSUW1) x BS26 | 127 | 68.5 | 21.1 | 61.7 | 0.0 | 9.7 | 0.8 |
| BS26 x (BS26xSUW1) | 128 | 64.8 | 21.8 | 60.4 | 0.0 | 11.7 | 0.0 |
| (BS26xSUW1) x SUWAN 1 | 129 | 51.0 | 28.3 | 58.5 | 0.0 | 6.0 | 0.8 |
| SUWAN 1 x (BS26xSUW1) | 130 | 65.0 | 28.4 | 62.2 | 0.0 | 4.0 | 0.8 |
| TUXPENO x BS13(S)C4 | 131 | 76.0 | 21.6 | 60.3 | 0.0 | 6.0 | 0.0 |
| (TUXxBS13) x BS13 | 132 | 57.4 | 20.5 | 62.2 | 0.8 | 6.4 | 0.0 |
| BS13 x (TUXxBS13) | 133 | 64.1 | 20.0 | 62.2 | 0.8 | 8.8 | 0.8 |
| (TUXxBS13) x TUXPENO | 134 | 45.6 | 25.1 | 61.6 | 2.4 | 6.5 | 0.0 |
| TUXPENO x (TUXxBS13) | 135 | 60.6 | 22.8 | 62.2 | 1.6 | 4.8 | 0.0 |
| BS13(S)C4 x TUXPENO | 136 | 68.3 | 23.7 | 58.6 | 0.0 | 4.3 | 0.8 |
| (BS13xTUX) x BS13 | 137 | 56.9 | 20.1 | 61.1 | 0.0 | 9.0 | 0.0 |
| BS13 x (BS13xTUX) | 138 | 64.9 | 20.4 | 62.2 | 1.6 | 10.5 | 0.8 |
| (BS13xTUX) x TUXPENO | 139 | 52.2 | 26.7 | 62.2 | 0.8 | 4.8 | 0.8 |
| TUXPENO x (BS13xTUX) | 140 | 57.9 | 22.6 | 61.0 | 5.7 | 5.8 | 0.0 |
| TUXPENO x BS26 | 141 | 51.2 | 19.7 | 55.1 | 0.9 | 8.2 | 1.7 |
| (TUXxBS26) x BS26 | 142 | 68.2 | 20.6 | 62.3 | 0.0 | 10.5 | 0.0 |
| BS26 x (TUXxBS26) | 143 | 64.5 | 19.8 | 59.9 | 0.0 | 7.6 | 0.8 |
| (TUXxBS26) x TUXPENO | 144 | 56.1 | 23.2 | 60.9 | 0.8 | 5.7 | 0.8 |
| TUXPENO x (TUXxBS26) | 145 | 59.2 | 22.8 | 61.0 | 0.0 | 9.9 | 0.8 |
| BS26 x TUXPENO | 146 | 55.9 | 21.1 | 45.5 | 0.0 | 1.1 | 0.0 |
| (BS26xTUX) x BS26 | 147 | 71.4 | 21.1 | 61.6 | 1.6 | 8.2 | 0.0 |
| BS26 x (BS26xTUX) | 148 | 65.6 | 20.2 | 61.1 | 0.0 | 6.6 | 0.0 |
| (BS26xTUX) x TUXPENO | 149 | 45.1 | 24.0 | 60.4 | 0.0 | 8.3 | 0.0 |
| TUXPENO x (BS26xTUX) | 150 | 48.3 | 26.5 | 59.8 | 1.7 | 5.8 | 0.0 |
| CATETO | 151 | 41.0 | 19.6 | 59.7 | 0.9 | 12.4 | 0.0 |
| BS13(S)C4 | 152 | 49.5 | 18.3 | 59.7 | 0.8 | 10.0 | 0.8 |
| BS26 | 153 | 63.1 | 21.3 | 62.2 | 0.8 | 16.9 | 0.0 |
| CARIBBEAN FLINT | 154 | 39.0 | 20.6 | 44.7 | 0.0 | 4.5 | 1.3 |
| MEXICAN DENT | 155 | 60.3 | 18.3 | 61.6 | 0.8 | 7.3 | 0.0 |
| ANTIGUA(M)C6 | 156 | 52.6 | 20.0 | 60.2 | 0.0 | 8.1 | 0.0 |
| BS16(S)C4 | 157 | 49.0 | 18.4 | 59.2 | 0.0 | 12.7 | 0.9 |
| SUWAN 1 | 158 | 29.0 | 39.0 | 53.1 | 4.5 | 7.4 | 1.0 |
| TUXPENO | 159 | 46.9 | 27.9 | 55.5 | 0.8 | 1.8 | 0.0 |
| BSSS(R)C11 | 160 | 51.5 | 20.1 | 58.8 | 0.0 | 5.1 | 0.0 |
| BSCB1(R)C11 | 161 | 38.2 | 18.0 | 61.6 | 0.0 | 9.7 | 0.0 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 87.9 | 19.6 | 61.0 | 0.0 | 8.2 | 0.0 |
| BS10(FR)C8 | 163 | 56.8 | 18.0 | 60.3 | 0.0 | 10.7 | 0.0 |
| BS11(FR)C8 | 164 | 66.8 | 19.0 | 61.6 | 0.8 | 8.1 | 0.0 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 73.6 | 18.8 | 61.6 | 0.0 | 4.9 | 0.0 |
| BS10C0 | 166 | 53.7 | 16.7 | 62.0 | 0.0 | 12.1 | 3.2 |
| BS11C0 | 167 | 52.5 | 19.4 | 61.7 | 0.8 | 11.3 | 0.0 |
| BS10C0xBS11C0 | 168 | 55.4 | 19.1 | 57.3 | 0.0 | 17.4 | 0.9 |
| Z.P.SYN.PI(M)C3 | 169 | 54.3 | 19.4 | 61.1 | 0.8 | 17.2 | 1.6 |
| EXPERIMENT MEAN | | 58.6 | 20.3 | 60.6 | 0.6 | 10.2 | 0.6 |
| S.E.TREAT. MEAN | | 5.4 | 0.7 | 1.4 | 0.9 | 3.0 | 0.8 |

CRAWFORDSVILLE 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| CATETO x BS13(S)C4 | 1 | 48.1 | 17.7 | 56.2 | 1.8 | 23.1 | 0.9 |
| (CATxBS13) x BS13 | 2 | 54.6 | 16.7 | 61.0 | 2.5 | 16.4 | 0.0 |
| BS13 x (CATxBS13) | 3 | 53.5 | 17.0 | 63.4 | 3.1 | 21.4 | 0.0 |
| (CATxBS13) x CATETO | 4 | 41.2 | 19.0 | 62.2 | 1.6 | 16.1 | 0.0 |
| CATETO x (CATxBS13) | 5 | 33.2 | 19.0 | 58.6 | 2.5 | 27.1 | 0.0 |
| BS13(S)C4 x CATETO | 6 | 40.9 | 18.6 | 58.0 | 0.0 | 32.1 | 0.9 |
| (BS13xCAT) x BS13 | 7 | 48.6 | 16.6 | 61.0 | 3.3 | 16.4 | 0.0 |
| BS13 x (BS13xCAT) | 8 | 47.1 | 17.0 | 60.4 | 2.4 | 18.3 | 0.9 |
| (BS13xCAT) x CATETO | 9 | 44.5 | 19.1 | 62.2 | 1.6 | 24.9 | 1.6 |
| CATETO x (BS13xCAT) | 10 | 41.8 | 18.0 | 55.6 | 1.8 | 17.7 | 0.0 |
| CATETO x BS26 | 11 | 53.5 | 19.0 | 64.0 | 2.3 | 15.6 | 0.0 |
| (CATxBS26) x BS26 | 12 | 50.5 | 18.8 | 61.6 | 0.8 | 18.7 | 0.8 |
| BS26 x (CATxBS26) | 13 | 58.2 | 18.2 | 62.8 | 1.6 | 19.2 | 0.0 |
| (CATxBS26) x CATETO | 14 | 47.4 | 19.4 | 64.0 | 0.0 | 15.7 | 1.6 |
| CATETO x(CATxBS26) | 15 | 40.8 | 19.0 | 55.0 | 1.9 | 23.0 | 0.0 |
| BS26 x CATETO | 16 | 30.9 | 19.1 | 59.8 | 0.8 | 16.1 | 0.0 |
| (BS26xCAT) x BS26 | 17 | 45.7 | 18.7 | 62.8 | 0.8 | 19.3 | 0.8 |
| BS26 x (BS26xCAT) | 18 | 54.1 | 18.8 | 60.4 | 0.8 | 18.3 | 0.0 |
| (BS26xCAT) x CATETO | 19 | 35.7 | 20.0 | 57.4 | 1.7 | 15.6 | 0.0 |
| CATETO x (BS26xCAT) | 20 | 41.5 | 18.0 | 56.2 | 1.9 | 17.4 | 1.9 |
| CARIB.FL.x BS13(S)C4 | 21 | 45.6 | 17.4 | 58.0 | 1.6 | 17.1 | 1.7 |
| (CARIBxBS13) x BS13 | 22 | 52.3 | 16.6 | 64.6 | 2.3 | 22.5 | 0.0 |
| BS13 x (CARIBxBS13) | 23 | 55.7 | 17.6 | 60.4 | 3.4 | 20.5 | 0.0 |
| (CARIBxBS13) x CARIB | 24 | 49.3 | 17.9 | 60.4 | 0.8 | 14.0 | 0.0 |
| CARIB x (CARIBxBS13) | 25 | 51.7 | 18.7 | 55.6 | 0.9 | 9.0 | 0.0 |
| BS13(S)C4 x CARIB.FLINT | 26 | 56.6 | 17.0 | 58.6 | 1.7 | 13.7 | 0.0 |
| (BS13xCARIB) x BS13 | 27 | 44.3 | 17.6 | 56.2 | 0.0 | 10.6 | 0.9 |
| BS13 x (BS13xCARIB) | 28 | 60.8 | 16.7 | 62.8 | 1.6 | 12.0 | 0.0 |
| (BS13xCARIB) x CARIB | 29 | 53.5 | 17.9 | 60.4 | 0.0 | 7.4 | 0.0 |
| CARIB x (BS13xCARIB) | 30 | 56.2 | 17.3 | 58.6 | 0.8 | 14.5 | 0.0 |
| CARIB.FLINT x BS26 | 31 | 61.1 | 20.4 | 58.6 | 0.0 | 9.3 | 0.0 |
| (CARIBxBS26) x BS26 | 32 | 46.9 | 17.8 | 64.0 | 0.0 | 17.1 | 0.8 |
| BS26 x (CARIBxBS26) | 33 | 53.3 | 19.9 | 58.0 | 0.8 | 18.8 | 0.0 |
| (CARIBxBS26) x CARIB | 34 | 55.6 | 18.9 | 61.6 | 1.6 | 12.2 | 0.0 |
| CARIB x (CARIBxBS26) | 35 | 53.6 | 19.0 | 56.8 | 2.6 | 17.1 | 0.0 |
| BS26 x CARIB.FLINT | 36 | 56.1 | 18.8 | 61.6 | 0.8 | 17.7 | 0.0 |
| (BS26xCARIB) x BS26 | 37 | 60.8 | 18.5 | 62.8 | 1.6 | 16.0 | 0.0 |
| BS26 x (BS26xCARIB) | 38 | 57.1 | 18.5 | 59.8 | 1.6 | 11.7 | 0.0 |
| (BS26xCARIB) x CARIB | 39 | 56.3 | 18.1 | 59.8 | 0.9 | 13.5 | 1.7 |
| CARIB x (BS26xCARIB) | 40 | 47.7 | 16.5 | 61.0 | 0.9 | 18.3 | 0.9 |
| MEX. DENT x BS13(S)C4 | 41 | 63.3 | 16.1 | 61.0 | 2.5 | 13.1 | 0.0 |
| (MEXxBS13) x BS13 | 42 | 53.0 | 16.4 | 59.2 | 4.0 | 11.8 | 2.6 |
| BS13 x (MEXxBS13) | 43 | 62.1 | 17.1 | 59.2 | 3.4 | 8.6 | 0.0 |
| (MEXxBS13) x MEX.DENT | 44 | 57.0 | 18.9 | 59.8 | 1.6 | 6.8 | 0.0 |
| MEX.DENT x (MEXxBS13) | 45 | 56.0 | 18.4 | 61.0 | 2.4 | 3.9 | 0.0 |
| BS13(S)C4 x MEX. DENT | 46 | 52.5 | 17.2 | 56.8 | 3.5 | 14.0 | 0.0 |
| (BS13xMEX) x BS13 | 47 | 49.9 | 16.5 | 57.4 | 0.9 | 14.9 | 0.0 |
| BS13 x (BS13xMEX) | 48 | 48.0 | 15.6 | 58.6 | 2.6 | 23.0 | 0.9 |
| (BS13xMEX) x MEX.DENT | 49 | 57.1 | 17.6 | 60.4 | 1.7 | 9.7 | 0.8 |
| MEX.DENT x (BS13xMEX) | 50 | 48.2 | 17.3 | 61.6 | 1.6 | 21.1 | 0.0 |
| MEXICAN DENT x BS26 | 51 | 51.0 | 18.1 | 56.2 | 1.7 | 11.6 | 0.0 |
| (MEXxBS26) x BS26 | 52 | 61.7 | 18.6 | 60.4 | 0.9 | 7.6 | 0.0 |
| BS26 x (MEXxBS26) | 53 | 48.0 | 18.8 | 61.0 | 0.8 | 16.4 | 0.0 |
| (MEXxBS26) x MEX.DENT | 54 | 56.6 | 18.4 | 63.4 | 4.0 | 10.2 | 0.0 |
| MEX.DENT x (MEXxBS26) | 55 | 52.6 | 17.3 | 61.0 | 1.7 | 9.8 | 0.0 |
| BS26 x MEXICAN DENT | 56 | 64.7 | 18.4 | 60.4 | 0.9 | 9.0 | 0.8 |
| (BS26xMEX) x BS26 | 57 | 58.1 | 17.9 | 59.8 | 0.0 | 15.0 | 2.5 |
| BS26 x (BS26xMEX) | 58 | 60.3 | 18.4 | 61.0 | 1.6 | 13.8 | 0.0 |
| (BS26xMEX) x MEX.DENT | 59 | 39.6 | 18.1 | 56.2 | 1.8 | 9.8 | 0.9 |
| MEX.DENT x (BS26xMEX) | 60 | 59.2 | 18.1 | 58.0 | 0.0 | 11.0 | 2.5 |

CRAWFORDSVILLE 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| ANTIGUA(M)C6 x BS13(S)C4 | 61 | 62.2 | 17.7 | 53.8 | 3.7 | 16.0 | 1.9 |
| (ANTxBS13) x BS13 | 62 | 52.7 | 18.3 | 61.6 | 3.2 | 15.4 | 0.0 |
| BS13 x (ANTxBS13) | 63 | 60.8 | 17.8 | 62.2 | 0.8 | 13.7 | 1.6 |
| (ANTxBS13) x ANTIGUA | 64 | 67.5 | 18.6 | 61.0 | 0.8 | 11.5 | 0.0 |
| ANTIGUA x (ANTxBS13) | 65 | 55.6 | 19.0 | 60.4 | 1.6 | 16.5 | 0.0 |
| BS13(S)C4 x ANTIGUA(M)C6 | 66 | 60.0 | 16.6 | 55.0 | 2.8 | 6.3 | 0.0 |
| (BS13xANT) x BS13 | 67 | 46.8 | 16.4 | 59.2 | 0.0 | 18.6 | 0.0 |
| BS13 x (BS13xANT) | 68 | 62.3 | 17.1 | 57.4 | 2.6 | 13.7 | 0.0 |
| (BS13xANT) x ANTIGUA | 69 | 60.2 | 17.6 | 59.8 | 0.8 | 15.9 | 1.6 |
| ANTIGUA x (BS13xANT) | 70 | 67.8 | 18.1 | 61.6 | 2.4 | 13.8 | 0.0 |
| ANTIGUA x BS26 | 71 | 70.6 | 19.4 | 63.4 | 0.8 | 10.2 | 1.6 |
| (ANTxBS26) x BS26 | 72 | 56.5 | 16.9 | 60.4 | 0.0 | 20.7 | 1.7 |
| BS26 x (ANTxBS26) | 73 | 63.3 | 17.7 | 60.4 | 0.8 | 9.2 | 0.8 |
| (ANTxBS26) x ANTIGUA | 74 | 58.6 | 20.3 | 58.6 | 0.0 | 13.7 | 0.0 |
| ANTIGUA x (ANTxBS26) | 75 | 51.7 | 19.3 | 62.2 | 0.8 | 19.3 | 0.0 |
| BS26 x ANTIGUA | 76 | 51.0 | 17.4 | 62.2 | 1.6 | 17.7 | 0.8 |
| (BS26xANT) x BS26 | 77 | 57.0 | 18.0 | 62.8 | 4.0 | 12.0 | 0.8 |
| BS26 x (BS26xANT) | 78 | 50.2 | 17.9 | 58.6 | 0.0 | 20.6 | 0.0 |
| (BS26xANT) x ANTIGUA | 79 | 57.4 | 18.6 | 61.6 | 2.4 | 10.6 | 3.2 |
| ANTIGUA x (BS26xANT) | 80 | 55.2 | 18.6 | 56.8 | 3.4 | 16.1 | 0.8 |
| BS16(S)C4 x BS13(S)C4 | 81 | 48.5 | 16.8 | 55.6 | 0.9 | 18.8 | 0.0 |
| (BS16xBS13) x BS13 | 82 | 40.7 | 17.6 | 59.8 | 0.0 | 23.4 | 0.0 |
| BS13 x (BS16xBS13) | 83 | 40.7 | 17.4 | 60.4 | 2.5 | 14.9 | 0.0 |
| (BS16xBS13) x BS16 | 84 | 51.1 | 17.6 | 55.6 | 3.4 | 15.4 | 0.0 |
| BS16 x (BS16xBS13) | 85 | 47.4 | 16.1 | 60.4 | 1.7 | 14.9 | 0.8 |
| BS13(S)C4 x BS16(S)C4 | 86 | 53.8 | 15.9 | 62.2 | 1.6 | 20.8 | 0.0 |
| (BS13xBS16) x BS13 | 87 | 50.0 | 16.2 | 58.6 | 3.7 | 14.1 | 0.8 |
| BS13 x (BS13xBS16) | 88 | 48.5 | 16.6 | 57.4 | 1.8 | 29.5 | 0.0 |
| (BS13xBS16) x BS16 | 89 | 53.4 | 17.0 | 58.0 | 0.8 | 17.2 | 0.8 |
| BS16 x (BS13xBS16) | 90 | 44.1 | 18.1 | 59.8 | 0.0 | 24.6 | 0.0 |
| BS16(S)C4 x BS26 | 91 | 55.7 | 17.6 | 58.0 | 2.6 | 11.1 | 0.0 |
| (BS16xBS26) x BS26 | 92 | 58.0 | 17.6 | 63.4 | 0.0 | 17.3 | 0.8 |
| BS26 x (BS16xBS26) | 93 | 58.2 | 17.6 | 56.2 | 0.9 | 7.9 | 0.9 |
| (BS16xBS26) x BS16 | 94 | 52.4 | 18.1 | 58.0 | 0.8 | 7.6 | 0.0 |
| BS16 x (BS16xBS26) | 95 | 52.9 | 17.4 | 56.2 | 0.8 | 14.2 | 3.5 |
| BS26 x BS16(S)C4 | 96 | 62.0 | 16.5 | 58.6 | 1.7 | 12.8 | 0.0 |
| (BS26xBS16) x BS26 | 97 | 53.5 | 17.5 | 58.6 | 1.6 | 10.2 | 0.8 |
| BS26 x (BS26xBS16) | 98 | 49.3 | 17.5 | 62.8 | 0.0 | 18.3 | 0.8 |
| (BS26xBS16) x BS16 | 99 | 48.0 | 17.6 | 61.6 | 3.3 | 17.9 | 0.0 |
| BS16 x (BS26xBS16) | 100 | 51.3 | 16.1 | 58.6 | 1.7 | 18.8 | 0.9 |
| BS13(S)C4 x BS26 | 101 | 58.3 | 17.4 | 59.8 | 0.9 | 12.5 | 0.0 |
| (BS13xBS26) x BS26 | 102 | 51.3 | 19.6 | 61.6 | 0.0 | 16.2 | 0.8 |
| BS26 x (BS13xBS26) | 103 | 45.0 | 18.6 | 62.8 | 0.8 | 7.1 | 0.0 |
| (BS13xBS26) x BS13 | 104 | 57.9 | 16.5 | 61.0 | 2.5 | 15.4 | 0.0 |
| BS13 x (BS13xBS26) | 105 | 53.8 | 17.5 | 61.0 | 2.4 | 13.5 | 0.9 |
| BS26 x BS13(S)C4 | 106 | 63.7 | 16.4 | 56.8 | 0.0 | 15.1 | 0.0 |
| (BS26xBS13) x BS26 | 107 | 47.6 | 18.6 | 58.0 | 1.7 | 19.2 | 0.9 |
| BS26 x (BS26xBS13) | 108 | 67.0 | 18.4 | 61.6 | 0.8 | 12.2 | 0.0 |
| (BS26xBS13) x BS13 | 109 | 45.4 | 16.0 | 56.8 | 0.9 | 22.1 | 0.0 |
| BS13 x (BS26xBS13) | 110 | 47.7 | 17.4 | 57.4 | 0.0 | 7.6 | 0.0 |
| SUWAN 1 x BS13(S)C4 | 111 | 79.5 | 24.6 | 60.4 | 0.9 | 7.5 | 0.8 |
| (SUW1xBS13) x BS13 | 112 | 63.6 | 20.4 | 59.8 | 0.0 | 9.0 | 0.0 |
| B73 x MO17 | 113 | 78.6 | 15.0 | 62.8 | 1.6 | 5.6 | 0.0 |
| (SUW1xBS13) x SUWAN 1 | 114 | 41.0 | 25.5 | 61.6 | 3.2 | 4.1 | 0.0 |
| SUWAN 1 x (SUW1xBS13) | 115 | 49.1 | 25.6 | 49.6 | 0.9 | 4.7 | 0.0 |
| BS13(S)C4 x SUWAN 1 | 116 | 73.4 | 22.9 | 55.0 | 0.8 | 10.4 | 0.0 |
| (BS13xSUW1) x BS13 | 117 | 56.5 | 19.7 | 56.2 | 0.0 | 7.2 | 0.0 |
| BS13 x (BS13xSUW1) | 118 | 58.1 | 19.8 | 60.4 | 4.2 | 14.8 | 0.0 |
| (BS13xSUW1) x SUWAN 1 | 119 | 61.8 | 25.8 | 59.2 | 5.2 | 8.6 | 0.0 |
| SUWAN 1 x (BS13xSUW1) | 120 | 59.3 | 25.6 | 58.0 | 2.7 | 2.6 | 0.0 |

CRAWFORDSVILLE 1990

| TREATMENT | ENTRY | GRAIN YIELD (Q/HA) | GRAIN MOIST (%) | STAND (X1000) | LODGING ROOT (%) | LODGING STALK (%) | DROPPED EARS (%) |
|---|---|---|---|---|---|---|---|
| SUWAN 1 x BS26 | 121 | 68.9 | 23.0 | 63.4 | 1.6 | 7.8 | 0.8 |
| (SUW1xBS26) x BS26 | 122 | 64.6 | 21.1 | 57.4 | 1.9 | 12.8 | 1.0 |
| BS26 x (SUW1xBS26) | 123 | 57.8 | 20.1 | 59.8 | 0.8 | 11.7 | 0.8 |
| (SUW1xBS26) x SUWAN 1 | 124 | 52.2 | 23.0 | 62.2 | 0.0 | 12.7 | 0.8 |
| SUWAN 1 x (SUW1xBS26) | 125 | 57.2 | 24.8 | 55.6 | 1.8 | 6.3 | 0.0 |
| BS26 x SUWAN 1 | 126 | 72.5 | 23.3 | 59.8 | 1.7 | 6.7 | 0.8 |
| (BS26xSUW1) x BS26 | 127 | 68.6 | 19.8 | 63.4 | 2.3 | 12.7 | 0.8 |
| BS26 x (BS26xSUW1) | 128 | 69.3 | 21.0 | 61.0 | 0.0 | 16.4 | 0.8 |
| (BS26xSUW1) x SUWAN 1 | 129 | 50.4 | 26.1 | 61.0 | 0.0 | 2.5 | 0.0 |
| SUWAN 1 x (BS26xSUW1) | 130 | 45.2 | 28.3 | 56.2 | 0.8 | 5.8 | 0.0 |
| TUXPENO x BS13(S)C4 | 131 | 69.7 | 20.1 | 59.8 | 1.8 | 11.7 | 0.0 |
| (TUXxBS13) x BS13 | 132 | 52.7 | 19.4 | 59.2 | 0.0 | 13.7 | 0.0 |
| BS13 x (TUXxBS13) | 133 | 53.3 | 18.9 | 61.6 | 0.8 | 16.2 | 0.0 |
| (TUXxBS13) x TUXPENO | 134 | 50.3 | 21.7 | 58.6 | 3.4 | 3.3 | 1.7 |
| TUXPENO x (TUXxBS13) | 135 | 58.4 | 21.2 | 56.8 | 0.0 | 4.3 | 0.9 |
| BS13(S)C4 x TUXPENO | 136 | 67.5 | 19.9 | 56.2 | 0.0 | 0.8 | 0.0 |
| (BS13xTUX) x BS13 | 137 | 60.9 | 17.0 | 65.8 | 1.5 | 14.4 | 2.3 |
| BS13 x (BS13xTUX) | 138 | 63.3 | 18.7 | 59.2 | 1.8 | 10.8 | 0.8 |
| (BS13xTUX) x TUXPENO | 139 | 54.6 | 20.8 | 49.0 | 2.5 | 9.8 | 0.0 |
| TUXPENO x (BS13xTUX) | 140 | 55.1 | 21.8 | 61.0 | 1.6 | 9.1 | 0.0 |
| TUXPENO x BS26 | 141 | 65.3 | 19.3 | 54.4 | 0.0 | 5.4 | 0.0 |
| (TUXxBS26) x BS26 | 142 | 63.0 | 19.7 | 61.6 | 0.0 | 9.8 | 0.0 |
| BS26 x (TUXxBS26) | 143 | 59.7 | 18.9 | 59.8 | 0.0 | 10.9 | 0.8 |
| (TUXxBS26) x TUXPENO | 144 | 52.5 | 22.1 | 58.0 | 4.3 | 7.1 | 0.0 |
| TUXPENO x (TUXxBS26) | 145 | 60.6 | 22.1 | 61.6 | 0.0 | 4.0 | 0.0 |
| BS26 x TUXPENO | 146 | 60.8 | 19.1 | 55.6 | 0.0 | 2.7 | 0.0 |
| (BS26xTUX) x BS26 | 147 | 64.7 | 20.0 | 62.8 | 0.8 | 11.1 | 0.0 |
| BS26 x (BS26xTUX) | 148 | 58.5 | 19.1 | 61.0 | 1.6 | 12.3 | 0.0 |
| (BS26xTUX) x TUXPENO | 149 | 49.6 | 22.6 | 57.4 | 0.0 | 2.6 | 0.0 |
| TUXPENO x (BS26xTUX) | 150 | 55.5 | 22.4 | 59.2 | 1.6 | 5.0 | 0.0 |
| CATETO | 151 | 23.0 | 18.1 | 57.4 | 3.5 | 20.4 | 0.0 |
| BS13(S)C4 | 152 | 44.5 | 16.1 | 56.8 | 0.0 | 15.8 | 0.0 |
| BS26 | 153 | 46.9 | 18.0 | 61.0 | 0.8 | 22.5 | 0.9 |
| CARIBBEAN FLINT | 154 | 36.6 | 17.8 | 53.2 | 0.0 | 11.3 | 0.0 |
| MEXICAN DENT | 155 | 49.6 | 17.5 | 54.4 | 1.8 | 13.5 | 0.0 |
| ANTIGUA(M)C6 | 156 | 54.8 | 18.1 | 61.0 | 0.8 | 13.9 | 0.0 |
| BS16(S)C4 | 157 | 38.3 | 17.7 | 60.4 | 0.0 | 18.3 | 1.7 |
| SUWAN 1 | 158 | 10.7 | 33.6 | 59.8 | 1.6 | 5.8 | 0.0 |
| TUXPENO | 159 | 36.8 | 23.0 | 53.8 | 2.8 | 2.8 | 0.0 |
| BSSS(R)C11 | 160 | 51.9 | 16.5 | 58.0 | 0.0 | 15.7 | 0.8 |
| BSCB1(R)C11 | 161 | 36.5 | 15.9 | 61.0 | 2.5 | 10.7 | 0.0 |
| BSSS(R)C11xBSCB1(R)C11 | 162 | 72.8 | 17.6 | 54.4 | 0.0 | 12.9 | 0.0 |
| BS10(FR)C8 | 163 | 51.8 | 15.7 | 59.2 | 0.0 | 11.0 | 0.0 |
| BS11(FR)C8 | 164 | 61.0 | 17.6 | 61.0 | 0.0 | 8.2 | 0.0 |
| BS10(FR)C8xBS11(FR)C8 | 165 | 76.4 | 18.3 | 61.6 | 0.0 | 13.7 | 0.8 |
| BS10C0 | 166 | 42.1 | 18.0 | 59.2 | 0.8 | 16.0 | 0.9 |
| BS11C0 | 167 | 46.4 | 20.7 | 61.6 | 0.8 | 15.2 | 0.0 |
| BS10C0xBS11C0 | 168 | 57.9 | 18.5 | 55.6 | 0.9 | 16.2 | 2.7 |
| Z.P.SYN.PI(M)C3 | 169 | 40.3 | 18.0 | 61.0 | 0.0 | 19.7 | 0.0 |
| EXPERIMENT MEAN | | 53.8 | 18.8 | 59.4 | 1.4 | 13.5 | 0.4 |
| S.E.TREAT. MEAN | | 5.0 | 0.8 | 2.5 | 1.2 | 3.7 | 0.8 |